The neurosurgical management of spinal metastases causing cord and cauda equina compression

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The authors report a series of 100 consecutive patients with spinal metastases causing cord or cauda equina compression, who were treated with surgical decompression. Of these, 30% (all women) had breast cancer. The most common primary neoplasm in man was prostatic carcinoma. Pain was the earliest and most prominent symptom, followed by weakness. Bladder dysfunction was recorded in 40 patients. The thoracic region was the most common site of cord compression (76 patients). Surgical treatment involved urgent and extensive laminectomy decompression. Concomitant spinal stabilization was required in 10 cases, involving posterior rib graft fusion in seven and Harrington rod instrumentation in three. At last follow-up review, 29 of these patients were living with an average postoperative survival of 2.3 years; 71 patients had died with an average survival of 8.8 months. Surgical decompression produced effective pain relief in 70% of the patients. Postoperatively, 58 patients could walk; of these, 40 were walking and continent of urine 6 months following surgery (including five patients who were totally paraplegic on admission). Positive approach and aggressive management in this problem can achieve results superior to those generally reflected in the literature.

KEY WORDS  •  spinal cord compression  •  laminectomy

Spinal metastases causing cord compression occur in about 5% of patients with systemic cancer. They inevitably produce devastating morbidity, and it is widely held that treatment of cord compression due to spinal metastases is ineffective. It is our view that such a gloomy verdict is not justified. We present the results of neurosurgical management in 100 such cases.

Summary of Cases

Clinical Material

We have treated 100 patients with spinal metastases in the Division of Neurosurgery at the Wellesley Hospital between 1968 and 1978. This series included 39 men and 61 women. The patients ranged from a 21-year-old woman with metastatic ovarian carcinoma, to an 80-year-old woman with metastatic myofibrosarcoma. The majority were distributed in the middle decades of life (Fig. 1), with a mean age of 53 years.

Culpable primary sites are shown in Fig. 2. By far the single most common primary neoplasm was breast cancer, which was seen in 30%, all women; in two-thirds of these it was situated in the left breast. The single most common primary neoplasm in men was carcinoma of the prostate (seven patients). Other genitourinary (GU) primary sites included the uterus (two), the ovary (two), the cervix (two), the bladder (two), and the kidney (one).
FIG. 1. Bar graph showing the age in our series of 100 patients with spinal metastases, which ranged from 21 years to 80 years. The majority were distributed in the middle decades of life. The mean age was 53 years.

Clinically, pain was the earliest and most prominent symptom. Local back pain was the presenting complaint in 80% of our patients. Palpation of the spine in the affected region generally elicited tenderness. Eighteen patients developed an associated radicular pain. Back pain preceded other manifestations of cord compression by as long as 1 year, and the average duration of pain preoperatively was 4.5 months.

Weakness usually occurred after the onset of pain. In one-third of cases, the weakness developed during the course of 1 week or longer, while in 11 patients it developed in less than 1 day; characteristically it became progressively more severe. In our series, at the time of surgery, 97% of patients demonstrated impaired motor function: 26 were classified as weak; 51 were bedridden; and 20 were paraplegic, that is, there was no clinically detectable voluntary motor function.

Sensory impairment was more difficult to assess due to its subjective nature. Abnormal sensory findings were demonstrated in 90 patients, and an absolute sensory level was recorded in 35. Five patients, all with pathological fracture dislocation, demonstrated clear-cut Brown-Séquard syndrome. Preoperatively, 40 patients had recorded bladder dysfunction.

Radiographic pathology was evident in all patients. The most common plain film abnormalities included pedicle erosion (winking owl, cover) or wedge compression of the vertebral body. Our series included seven patients with pathological fracture dislocation. Three of these involved the cervical segments (Fig. 3), and four occurred in the upper thoracic region.

A complete block to contrast material was seen at myelography in 76 patients. In three cases an intradural, extramedullary lesion was identified (Fig. 4). Myelography was not done in 10 patients, including three with

FIG. 2. Bar graph showing the relative frequency of culpable primary neoplasms. GU = gastrourinary sites, including carcinoma of the prostate; GI = gastrointestinal tract; Sa = sarcoma.
pathological fracture dislocation of the cervical spine, in whom the risks were judged to be greater than the potential benefit of the examination.

The distribution of compression-producing metastases is shown in Fig. 5. Three pathological fracture dislocations are represented in the cervical region, 21 metastases occurred in the lumbar segments, and the majority (76) occurred in the thoracic region. The levels about the T4 and T11 segments appeared most frequently involved.

Treatment

Surgical treatment involved urgent and extensive laminectomy decompression. The dural sac was decompressed to beyond the equator, with removal of as much tumor as was readily accessible. Particular care was taken to decompress the nerve roots in 18 patients with radicular pain syndromes, and in those with thoracic girdle pain the involved roots were crushed. Once decompression beyond the level of obstruction had been achieved, it was our practice to pass a small red rubber catheter extradurally, proximally, and distally along the spinal axis, to rule out further obstruction.

Intraoperative bleeding was occasionally a problem. The source was inevitably the cut surface of residual tumor that could not be removed. Consequently, it occasionally became necessary to open the dura in the exposed field, and to stitch the edges back over the wound margins in order to control the extradural bleeding. In each case the arachnoid was neatly left intact.

Four of our patients were found to have intradural, extramedullary pathology. In one of these, a well circumscribed melanoma, and in another a metastatic breast nodule was removed. A third patient was found to have extensive Hodgkin's disease in the subdural space, and the fourth proved to have an infiltrative arachnoiditis. Subsequently, intracranial metastases were demonstrated in each of the first three cases.

Patients with fracture dislocation were managed initially with skull tong traction followed by laminectomy decompression and posterior rib graft fusion.

Results of Treatment

In spite of the fact that most patients were systemically debilitated, and had been subjected to extensive radiation and chemo-
Preoperative pain was relieved in 70% of patients. Postoperatively, 58 patients were ambulatory. Another 19 showed significant improvement in motor function. If we define a "satisfactory" result to include ability to walk, urinary continence, and survival of 6 months or longer, then 40 of our patients fell into this category.

We also compared the results of surgery against level of involvement (Fig. 6). The number of satisfactory results (walking and continent 6 months postoperatively) was expressed as a percentage of the total at each level. The outcome was worst when compression occurred at the T-8 or uppermost lumbar levels.

Discussion

Spinal metastases causing cord compression occur in only about 5% of patients with systemic cancer, but they inevitably produce devastating morbidity. The clinical manifestations constitute a characteristic syndrome. The cardinal features include pain, weakness, sensory impairment, and bladder dysfunction.

Back pain in a patient with systemic cancer heralds spinal metastases and is the forerunner of cord compression. Local back pain is the initial symptom in the majority of patients. Of our patients, 80% presented with local back pain, 18 of whom had associated radicular syndrome. Effective pain relief was enjoyed postoperatively by 70%.

Weakness usually occurred after the onset of back pain. It may develop gradually, as with slowly evolving compression syndrome, or it may occur abruptly, as following pathological compression fracture or fracture dislocation of the spine. In more than three-fourths of our series, the patients either walked (58 patients) or enjoyed improved motor function (19 patients) following surgery. The less favorable outcome, in this regard, experienced by patients with cord compression about the T-8 and upper lumbar segments, may reflect increased vulnerability of these areas. Interference with major radicular arteries supplying blood to the spinal cord at these respective levels could contribute to the relatively poor result following surgery.

It has been stated that recovery from paraplegia due to spinal cord compression...
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Fig. 6. Results expressed as a percentage of the total at each level. The outcome was worse when compression occurred at the T-8 or uppermost lumbar levels.

does not occur. Examining our results in the 20 patients who were paraplegic at the time of surgery, we have found that five of these enjoyed a "satisfactory" outcome, that is, they were ambulatory and continent of urine 6 months following surgery. As might be anticipated, the compression involved the cauda equina in two cases. However, in three of the five "satisfactory" results, the thoracic segments were affected. Curiously, culpable pathology in each of these three cases was associated with compression fracture of the vertebral body.

In this series the majority of patients (79) were referred from the Regional Cancer Treatment Center, Princess Margaret Hospital (PMH), Toronto. Most had already been subjected to radiotherapy, with or without chemotherapy. The contiguity of PMH and the Wellesley Hospital has enabled prompt consultation and permitted rapid transfer of patients requiring emergency surgery. Furthermore, in consultation with our oncology colleagues, each patient was considered for postoperative radiation and/or chemotherapy. The expeditious treatment and full follow-up continuity thus achieved may be factors reflected in our results, which are more optimistic than those of other series. In our experience, the widely held view that surgical treatment of cord compression due to spinal metastases is ineffective is not justified.

References


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