Anterior Versus Posterior Decompression for Symptomatic Spinal Metastasis

R.G. Perrin and R.J. McBroom

ABSTRACT: Management of patients with symptomatic spinal metastasis is designed to (1) relieve pain, and (2) restore or preserve neurologic function. The surgical strategy must include provisions for decompression of the dural sac and nerve roots, and stabilization of the spinal column. The optimal surgical approach, whether from in front or from behind is determined by a number of factors including (1) tumour location, (2) spinal level, (3) fixation factors, (4) patient debility.

RESUME: Decompression anterieure versus decompression posterieure dans le cas de metastases spinales symptomatiques Le traitement des patients presentant des metastases spinales vise essentiellement 1) a soulager la douleur et 2) a restorer ou a preserver la fonction nerveuse. La manoeuvre chirurgicale doit prevoir la decompression du sac dural et des racines nerveuses et la stabilisation de l’epine dorsale. La meilleure approche chirurgicale, qu’elle soit anterieure ou postiere, est determinee par un certain nombre de facteurs dont 1) la localisation de la tumeur; 2) son niveau; 3) les elements de fixation; 4) l’etat de debilite du patient.

Controversy concerning the management of patients with symptomatic spinal metastasis has focussed firstly on the relative merits of radiation and surgery (or a combination of these treatment modalities) and secondly on the optimal approach (decompression from behind or from in front) in those patients selected for surgical treatment.

It has been our practice to regard radiation therapy as the initial treatment of choice and to consider surgical decompression: (1) when radiation therapy fails, (2) if the diagnosis of the extradural compressing lesion is in doubt, (3) in patients with pathological fracture dislocation, and (4) when rapidly evolving or far advanced paraplegia has occurred.

Our initial efforts in the management of patients with symptomatic spinal metastasis involved posterior decompression procedures. More recently we have accumulated a series of patients with symptomatic spinal metastasis treated by anterior decompression procedures. The purpose of this paper is to summarize our experience with anterior and posterior approaches, and to examine factors which determine the optimal surgical strategy for the treatment of patients with symptomatic spinal metastasis.

MATERIALS AND METHODS

(a) Posterior Decompression

Previous reports have detailed our series of patients managed by posterolateral decompression of the dural sac and nerve roots. There were 200 consecutive cases, including 86 men and 114 women, ranging in age from 21 to 80 years. Culprate primaries originated most commonly from breast followed by prostate and lung; the origin of spinal metastasis was unknown in 9% of patients (Table 1). Clinically, pain was the earliest and most prominent feature in 174 patients (87%). Pre-operative motor testing revealed full power (Grade 5/5) in 10 cases (5%), 64 patients (32%) were classified as weak but ambulatory (Grade 4/5), 102 (51%) were bedridden (Grade 1-3/5) and 24 (12%) were frankly paraplegic (no clinically detectable voluntary movement). Sphincter dysfunction was recorded for 86 patients (43%), (Table 2).

Radiographic abnormalities were documented in all patients. The most common plain film finding was pedicle erosion (“winking owl sign”, Figure 1). Myelography most often demonstrated a complete block at the site of spinal cord compression, and when the clinical and myelographic levels were incongruous, or, when we suspected multiple levels of involvement, then cisternal myelography was also carried out to more accurately delineate the extent of disease (Figure 2).

The posterior surgical approach involved a wide laminectomy extending for half a level above and half a level below the compressing lesion, and with decompression of the dural sac to beyond its equator. The tumour-destroyed lateral elements were resected posterolaterally permitting access...
to the vertebral body. More anteriorly situated tumour could thus be removed until circumferential decompression of the dural sac and nerve roots was achieved.

Spinal stabilization was carried out using a variety of fixation devices including autologous rib graft, methylmethacrylate struts, Harrington instrumentation, and Luque rods (Figure 3). 8

RESULTS

One hundred and fifty-nine patients (80%) reported pain relief following posterolateral decompression. One hundred and thirty-one patients (65%) walked postoperatively, compared to 74 (37%) who were walking preoperatively. Eight patients (4%) were worse. Fifteen patients died within 30 days of surgery giving an operative mortality rate of 8%. Eighty-four patients (42%) achieved a “satisfactory result”, i.e. they were walking and continent 6 months following surgery (Table 3).

Table 1: Culpable primaries among 200 consecutive patients treated by posterolateral decompression

<table>
<thead>
<tr>
<th>PRIMARY DECOMPRESSION</th>
<th>Breast</th>
<th>Prostate</th>
<th>Lung</th>
<th>Lymph</th>
<th>GI</th>
<th>GYN</th>
<th>Sarcoma</th>
<th>Kidney</th>
<th>Skin</th>
<th>Nasoph.</th>
<th>Thyroid</th>
<th>Bladder</th>
<th>Parotid</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>62</td>
<td>20</td>
<td>17</td>
<td>15</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>total</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Table 2: Clinical features among 200 consecutive patients prior to posterolateral decompression. The numbers in brackets indicate muscle strength on a 0-5 grading scale

<table>
<thead>
<tr>
<th>SPINAL METASTASIS (Posterior Decompression)</th>
<th>pain: 87%</th>
<th>motor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>clinical</td>
<td>normal</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>weak</td>
<td>32%</td>
</tr>
<tr>
<td></td>
<td>bedridden</td>
<td>51%</td>
</tr>
<tr>
<td></td>
<td>paraplegic</td>
<td>12%</td>
</tr>
</tbody>
</table>

Table 3: Postoperative status of 200 consecutive patients following posterolateral decompression for extradural spinal metastasis

<table>
<thead>
<tr>
<th>SPINAL METASTASIS (Posterior Decompression)</th>
<th>pain relief: 80%</th>
<th>motor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>results</td>
<td>ambulatory</td>
<td>65%</td>
</tr>
<tr>
<td></td>
<td>improved</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>unchanged</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>worse</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>mortality (30 days)</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>“satisfactory result”</td>
<td>42%</td>
</tr>
</tbody>
</table>

Figure 1 — AP Radiograph of lumbar spine showing pedicle erosion (arrow) (“Winking Owl Sign”).

Figure 2 — Lumbar myelograph showing complete block from below (right photograph) and cisternal myelograph showing complete block from above (left photograph), to delineate the extent of the extradural compressing lesion.
Anterior decompression of the dural sac and nerve roots required resection of the major portion of an involved vertebral body (Figure 4). Adequate anterior decompression necessitated resection at two contiguous vertebral bodies in 6 patients. Stabilization was provided by a stainless steel plate contoured to size with dimensions determined intraoperatively to fit the decompression defect and fixed in place with fully threaded cancellous screws. Methylmethacrylate, moulded to fill the bracketed defect, was inspissated through the holes in the plate to hold the acrylic in place (Figure 4).

RESULTS

Nineteen patients (90%) reported pain relief. Sixteen (76%) were ambulatory following surgery, compared to 8 (38%) who were walking preoperatively. One patient (5%) was worse after anterior decompression and stabilization (Table 6).

DISCUSSION

Symptomatic spinal metastasis represents a serious complication of systemic cancer. The clinical presentation begins, in about 90% of patients, with local back or neck pain. Tenderness to percussion over the involved vertebrae is usually present. A radicular pain syndrome may be evident — with or without segmental spinal pain and tenderness. Characteristically, pain

![Figure 3](https://www.cambridge.org/core/terms). https://doi.org/10.1017/S0317167100026871

**Table 4: Culpable primaries among 21 consecutive patients treated with anterolateral decompression**

<table>
<thead>
<tr>
<th>ANTERIOR DECOMPRESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>primary:</td>
</tr>
<tr>
<td>Breast</td>
</tr>
<tr>
<td>Kidney</td>
</tr>
<tr>
<td>Prostate</td>
</tr>
<tr>
<td>Lung</td>
</tr>
<tr>
<td>Ovary</td>
</tr>
<tr>
<td>Uterus</td>
</tr>
<tr>
<td>?</td>
</tr>
<tr>
<td><strong>21 patients</strong></td>
</tr>
</tbody>
</table>

**Table 5: Clinical features among 21 consecutive patients prior to anterolateral decompression**

<table>
<thead>
<tr>
<th>SPINAL METASTASIS (Anterior Decompression)</th>
</tr>
</thead>
<tbody>
<tr>
<td>clinical:</td>
</tr>
<tr>
<td>pain: 100%</td>
</tr>
<tr>
<td>motor: 19% normal</td>
</tr>
<tr>
<td>19% weak</td>
</tr>
<tr>
<td>52% bedridden</td>
</tr>
<tr>
<td>9% paraplegic</td>
</tr>
<tr>
<td><strong>1-3/5</strong></td>
</tr>
<tr>
<td><strong>0/5</strong></td>
</tr>
</tbody>
</table>

**Table 6: Postoperative status of 21 consecutive patients following anterolateral decompression for extradural spinal metastasis**

<table>
<thead>
<tr>
<th>SPINAL METASTASIS (Anterior Decompression)</th>
</tr>
</thead>
<tbody>
<tr>
<td>results:</td>
</tr>
<tr>
<td>pain relief: 90%</td>
</tr>
<tr>
<td>motor:</td>
</tr>
<tr>
<td>ambulatory: 76%</td>
</tr>
<tr>
<td>improved: 19%</td>
</tr>
<tr>
<td>worse: 5%</td>
</tr>
<tr>
<td>mortality (30 days): 5%</td>
</tr>
<tr>
<td>&quot;satisfactory result&quot;: 33%</td>
</tr>
</tbody>
</table>
is followed by weakness, sensory loss and sphincter dysfunction, all of which will progress relentlessly to complete an irreversible paraplegia unless timely treatment is undertaken.

Surgical intervention for symptomatic spinal metastasis is designed to relieve pain and preserve or restore neurologic function. Treatment is essentially palliative. Nevertheless, relief from pain and preservation or restoration of neurologic function contributes immeasurably to the quality of remaining life.

Current controversy concerning the surgical management of patients with symptomatic spinal metastasis is focussed on the most appropriate surgical approach, i.e. decompression from in front or from behind. Critics of posterior decompression procedures point out (and correctly so) that simple laminectomy is inadequate. They point out that the compressing tumour is largely anterior or anterolateral and then conclude, incorrectly, that anteriorly disposed spinal metastasis must be removed from in front (Figure 5a).

The surgical approach from behind with wide laminectomy and posterolateral exposure of the dural sac has been shown to result in effective decompression of the spinal cord and nerve roots. This approach most often includes resection of the tumour-destroyed lateral elements and thus provides access to the anterior aspect of the dural sac allowing extensive and circumferential decompression of the dural sac and nerve roots (Figure 5b).

The anterolateral approach involves resecting the major portion of an involved vertebral body and has been reported to permit effective removal of anteriorly situated epidural tumour. Circumferential decompression of the dural sac and nerve roots bilaterally is, however, rarely possible due to limited access around the dural sac from the anterolateral approach (Figure 5c).

It has been our clinical impression that pain relief achieved following anterior decompression and stabilization may be superior to that obtained following posterolateral procedures. To draw further conclusions from the results of the retrospective analyses we have reported would be erroneous. Rather, the benefit of our experience with both posterior and anterior approach for the treatment of symptomatic spinal metastasis lies in the distillation of factors which must be considered and which serve as guidelines in determining the appropriate surgical strategy as outlined below (Table 7).

(1) Tumour Location
It has been our observation that in the large majority of patients with symptomatic spinal metastasis the dura is compressed by tumour mass that is located lateral to it, often anterolateral, but lateral nonetheless. It is uncommon for an epidural metastasis causing cord compression to be exclusively anterior, and rarely is the metastasis exclusively posterior to
patients treated with posterolateral decompression followed by Luque rods stabilization, wound breakdown occurred in 24% of patients. Contributing factors to this high complication rate include a radiated field, use of high dose steroids, systemic debilitation of the patient, as well as the lengthy operative procedure with installation of bulky stabilization apparatus.

Stabilization from in front is not practical if more than two spinal segments are decompressed. Furthermore, secure stabilization relies on sufficient bony integrity at levels adjacent to the decompression site to accept fixation devices.

(4) Patient Debility

The patient may be too sick systemically to tolerate an anterior transthoracic or thoracoabdominal decompression procedure which is a much more formidable undertaking than the posterior approach.

CONCLUSION

Successful surgical management of patients with symptomatic spinal metastasis requires not only decompression of the spinal cord and nerve roots, but must also provide for stability of the spinal column. Based on our experiences with approaches from behind and from in front, a variety of factors determine the most appropriate surgical strategy. No single approach is always applicable and the treatment team must be prepared to execute the optimal approach.

ACKNOWLEDGEMENTS

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REFERENCES