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Myelography in Cancer Patients: Modified Technique

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Because of the frequency of multiple sites of involvement, a thorough evaluation of the entire spinal canal is essential for detection and treatment of spinal compression in cancer patients. For the examination of the entire spinal canal in cancer patients, a modified approach is described using water-soluble contrast medium (metrizamide), oil-based material (Pantopaque), and a "squeezing" technique for a complete myelographic block. Of 240 patients who underwent myelography for possible spinal compression, the squeezing technique was applied through a lumbar puncture to demonstrate a complete block in 39 patients; six of these had more than one block. Of the other 201 patients, the quality of the myelograms was satisfactory or excellent in 189 (94%).

Spinal cord and cauda equina compression in cancer patients are most often due to epidural and/or leptomeningeal metastases. Myelography is frequently requested at the slightest suspicion of spinal compression, especially in view of the poor correlation between clinical and myelographic findings. A recent prospective study clearly demonstrated the necessity for myelography when patients have subtle symptoms and signs [1]. A high incidence of positive myelograms is found in patients with radiculopathy or with back pain but no neurologic deficits. An accurate, safe, and efficient technique for the complete evaluation of the entire spinal canal is needed for cancer patients with possible spinal compression(s).

Materials and Methods

From November 1982 to May 1984, 240 cancer patients underwent myelography for possible spinal compression at M. D. Anderson Hospital and Tumor Institute. Before the procedure, the clinical findings were discussed with the referring neurologist or neurosurgeon, and the recent conventional radiographs of the entire spine were reviewed to define the level(s) of primary interest. The possibility of increased intracranial pressure and brain parenchymal lesions was determined before myelography.

A lumbar puncture using a 20-gauge needle with the patient in the prone position was performed routinely at the level of L2–L3, unless this level was of major concern, in which case the L4–L5 interspace was used. Once the subarachnoid space was entered, 1–2 ml of Pantopaque was introduced through a connecting tube with a three-way stopcock without removing any cerebrospinal fluid (CSF). With the patient in the prone Trendelenburg position, this small amount of Pantopaque was manipulated in a cephalad direction under fluoroscopic control.

If a complete block was encountered, another 2–3 ml of Pantopaque was introduced, and radiographs were obtained to document the caudal end of the block. After the level of the block was marked on the patient's skin with an indelible marker, room air was aspirated through a three-way stopcock and a micropore filter and slowly injected into the lumbar subarachnoid space until the Pantopaque dripped beyond the obstruction. Usually, 5–10 ml of air was sufficient; larger amounts, up to 15–20 ml, were sometimes needed for higher block(s). From the start of this "squeezing" maneuver, the air injected was prevented from leaking by the use of a closed system and the connecting tube, which was not disconnected from the spinal needle until the patient was returned to the horizontal position and the study

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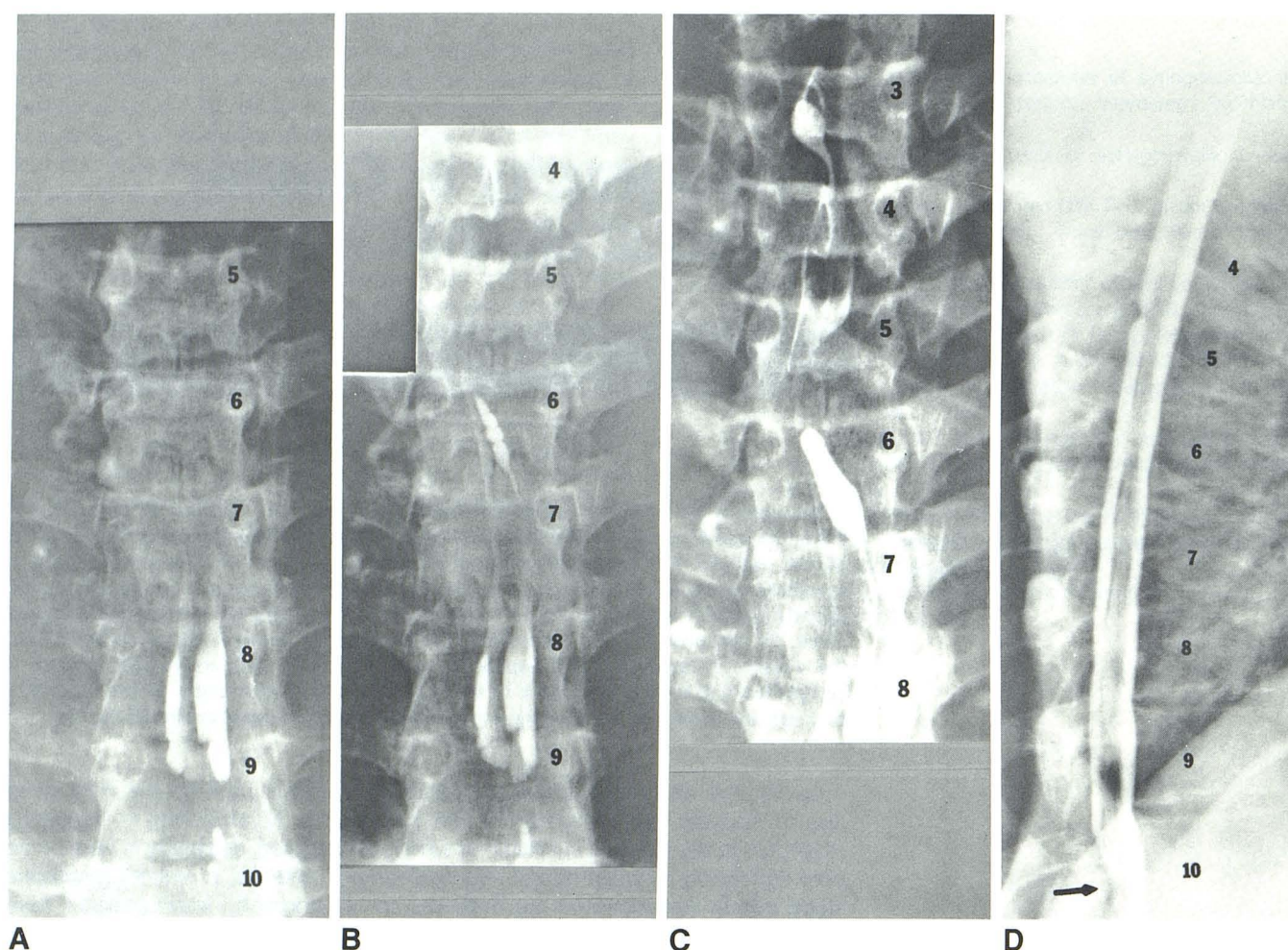


Fig. 1.—Case 1. **A–C**, Sequential AP spot films while Pantopaque was being squeezed around lesion clearly delineate nature of block (elongated epidural lesion in serpentine fashion) and extent (T4–T8) of epidural abscess. **D**, Lateral

view of follow-up thoracic myelogram. Thoracic canal is patent with mild residual posterior epidural compression at T10 (arrow).

was completed. Fluoroscopic spot films were obtained during the passage of Pantopaque around the obstruction. After sufficient Pantopaque, usually 1–1.5 ml, had passed beyond the obstruction, an effort was made to gather the Pantopaque in the high cervical region or at the foramen magnum. In the presence of multiple sites of compression, each block could be bypassed by using the same maneuver. The patient was then turned into an erect or semierect position for demonstration of the cephalic end(s) of the block(s). The needle, connecting tube, and stopcock were removed together after the patient was returned to the horizontal position. No attempt was made to remove the injected Pantopaque.

If there was no complete block, at least 5 ml of CSF was collected for laboratory examination, especially for cytology. The procedure then proceeded for a complete study of the spinal canal with metrizamide in varying concentrations, dependent on the level of prime interest as well as on the patient's general condition and constitution. If the patient was obese with a short neck and the area of concern was at the cervicothoracic junction, consideration was given to a

complete study with Pantopaque from the start, due to the possible inadequate opacification of the contrast column in lateral radiographs.

Results

No apparent severe complications were encountered in the 240 patients. The squeezing technique through a lumbar puncture was applied to demonstrate complete block(s) in 39 patients (16%) without a failure; among these 39 cases, six had multiple blocks. No adverse effect or exaggeration of the preexisting neurologic deficit was noted. No additional high cervical puncture was necessary.

The quality of the metrizamide myelograms in the 201 patients, after exclusion of a complete block by 1–2 ml of Pantopaque, was satisfactory or excellent in 189 cases (94%). The other 12 cases were supplemented by a subsequent metrizamide CT study because of suboptimal density of the metrizamide myelogram.

Representative Case Reports

Case 1

A 33-year-old man had a large soft-tissue fibrosarcoma of the posterior thoracic wall resected with a laminectomy from T5 to T10. His presurgical myelogram was normal. Postoperatively, he developed a persistent wound infection. One month after surgery, he had acute, progressive weakness of his legs lasting 1 week.

A limited Pantopaque myelogram revealed a complete block at the upper aspect of T8. The squeezing technique using 15 ml of room air delineated a serpentine epidural defect producing compression from T4 to T8. This was considered to be an epidural abscess (figs. 1A–1C). Vigorous antibiotic treatment eventually controlled the infection, and the patient improved over the next 3 weeks. Follow-up myelography showed a patent thoracic canal with a mild residual posterior epidural defect at T10 (fig. 1D).

Comments. Spot films during the "squeezing" of Pantopaque around the lesion clearly demonstrated the exact nature and extent of the epidural abscess.

Case 2

A 36-year-old woman with widespread metastatic breast cancer developed midthoracic pain of gradual onset. Neurologic examination revealed no definite motor or sensory deficit. Percussion tenderness was noted in the lower thoracic region. Neck flexion produced pain in the midthoracic area. Conventional radiographs of the spine demonstrated osteolytic metastases involving T1, T6, and T12. Myelography using 4 ml of Pantopaque and 15 ml of room air revealed complete blocks from T11–T12 to T12–L1 and from T5–T6 to T6–T7 (fig. 2), as well as an incomplete block at C7–T1 on the right. The patient tolerated the procedure without complication. Subsequently, she received local irradiation to the areas of involvement and remained ambulatory for the next 15 months.

Comments. Careful application of the squeezing technique was demonstrated here to be safe and efficient in the presence of multiple blocks. A conventional lumbar approach with the addition of a high cervical puncture might have identified the block to be from T5 to L1 without revealing the patency of the spinal canal in between. Definition of the specific sites of involvement by modified Pantopaque myelography allowed the radiotherapist to tailor the treatment field to the disease. In patients myelosuppressed by chemotherapy, additional irradiation may be associated with grave consequences.

Case 3

A 51-year-old woman with malignant melanoma had proximal muscle weakness of the left arm and both legs with left-sided hyperreflexia and a questionable T9 sensory level. Conventional radiography showed compression fractures of C7, T9, and L3 vertebral bodies without significant spinal malalignment. After 1 ml of Pantopaque disclosed a grossly patent spinal canal, 10 ml of CSF was collected for laboratory examination including cytology. Subsequent complete myelography with metrizamide was normal (fig. 3). The CSF cytology was positive for malignant cells, and the patient received chemotherapy with methotrexate through an Ommaya reservoir placed in the lateral ventricle for the treatment of leptomeningeal metastases.

Comments. The use of Pantopaque (1–2 ml) to exclude the presence of a complete block did not degrade the quality of the subsequent metrizamide myelogram. The diagnosis of leptomeningeal metastases is established most often by CSF cytology, especially in the absence of an epidural defect.

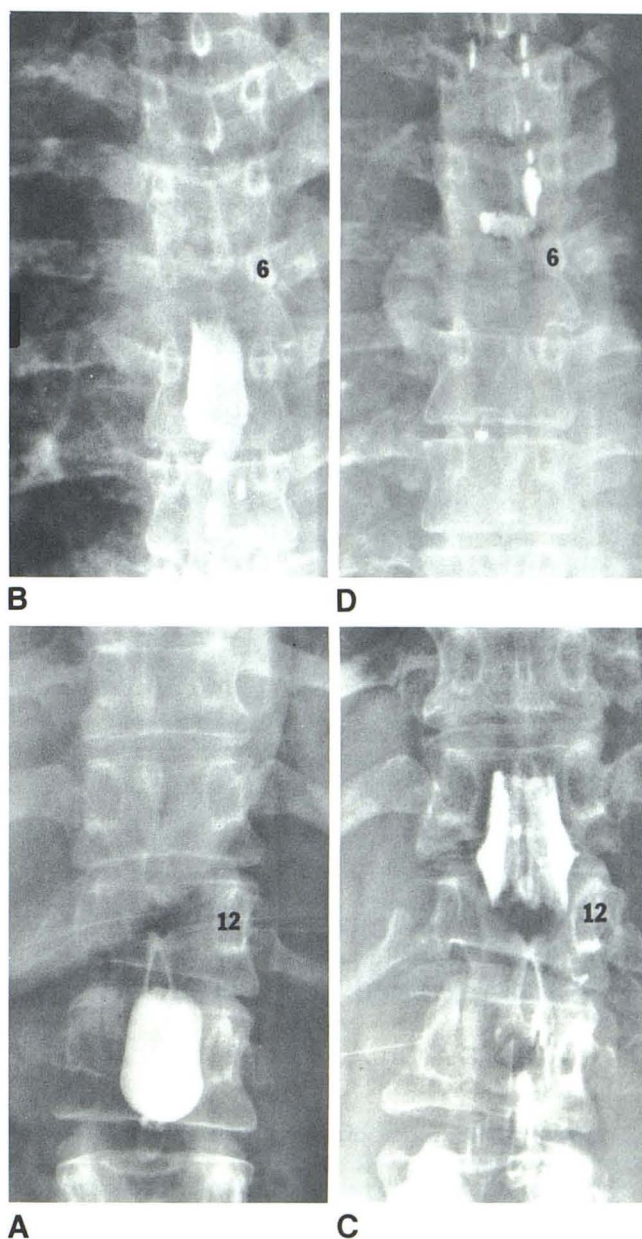


Fig. 2.—Case 2. Spot films in Trendelenburg position during squeezing. Caudal ends of lower complete block at T12–L1 (A) and higher complete block at T6–T7 (B). Spot films in upright position after squeezing. Cephalic ends of lower complete block at T11–T12 (C) and higher complete block at T5–T6 (D).

Case 4

A 17-year-old woman with a 1 month history of gradual weakness of both legs had an acute loss of bowel and bladder control. Metrizamide myelography at another institution via the lumbar route revealed a complete block at L1 without the demonstration of the cephalic end of the block. A laminectomy was performed from T12 to L2 without significant improvement. Myelography was repeated at M. D. Anderson Hospital 2 months later. After the initial injection of 1 ml of Pantopaque, which ruled out a complete block, metrizamide

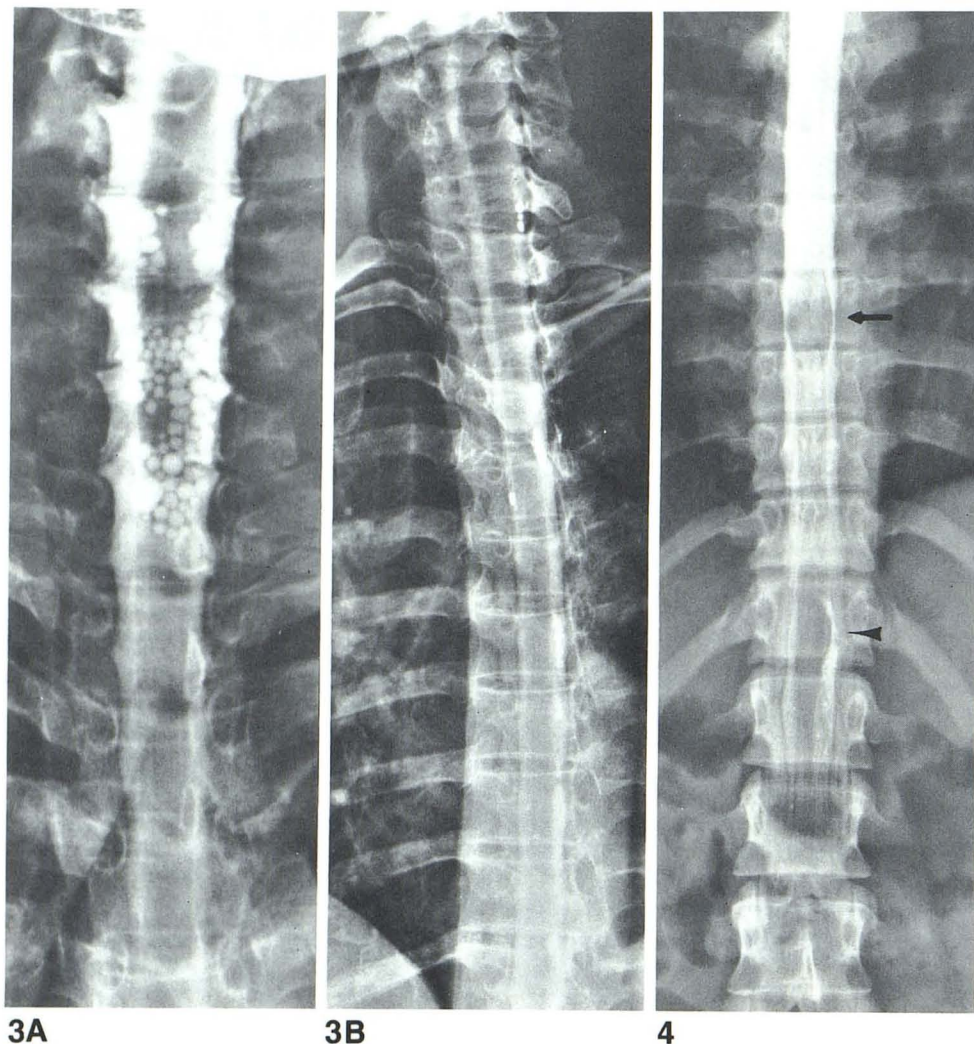


Fig. 3.—Case 3. Spots films of cervical region (A) and overhead film of thoracic region (B). Limited Pantopaque did not degrade quality of metrizamide myelograms.

Fig. 4.—Case 4. Postsurgical follow-up myelogram. Expansile intramedullary lesion at T8 level (arrow) in addition to known lesion at end of spinal cord (arrow-head).

myelography defined an intramedullary lesion at the T8 level in addition to the known lesion (fig. 4).

Comments. This case dramatically illustrates the necessity for demonstrating the complete extent of the lesion. An additional cervical puncture would have satisfied this requirement. After surgery and irradiation, the complete block no longer existed. The use of Pantopaque and metrizamide administered through the lumbar route during the second myelogram adequately defined the entire neoplasm.

Discussion

Spinal compression in cancer patients often produces subtle symptoms; there may be an absence of objective findings even when a complete block of the spinal canal is present. Furthermore, treatment is often too late to influence the final outcome in terms of the return of neurologic function [2]. Therefore, a thorough evaluation of the entire spinal canal is imperative for early detection and treatment of spinal compression.

Conventional radiography of the spine is inaccurate in predicting the exact level and extent of the spinal compression.

Although sensitive in the detection of bone metastases, radio-nuclide bone scans are of no value in evaluating epidural or intradural metastases. Despite the recent advances, computed tomography (CT) still remains impractical in evaluating the entire spinal canal for possible compression(s) in cancer patients. The lack of definite localization by objective neurologic findings is the main handicap in the satisfactory use of CT, even with intrathecal metrizamide. Magnetic resonance (MR) imaging appears promising for the study of the entire spinal canal noninvasively [3], but its effectiveness and accuracy remain to be proven. At present in cancer patients, myelography is the best imaging choice available for complete evaluation of possible spinal compression, despite its invasiveness, discomfort, and risk.

Metrizamide has replaced Pantopaque as the myelographic agent of choice for the evaluation of the entire spinal canal in the absence of a complete block [4, 5]. However, Pantopaque still remains valuable for selected cases with a possible spinal block. Using our squeezing technique, which has proven to be efficient and safe since initially reported in 1980 [6], the cephalad end of the block(s) can be readily demonstrated.

High cervical puncture using Pantopaque or metrizamide is insufficient for evaluation of multiple blocks and is of greater risk to most of the cancer patients, who often undergo the procedure in acute distress.

The limited amount of Pantopaque used for the detection of a complete block does not degrade the quality of subsequent metrizamide myelography or interfere with the diagnosis on CT scan, which might become indicated at a later date. The frequency of a satisfactory metrizamide study after injection of 1–2 ml of Pantopaque is in keeping with the reported results of complete metrizamide myelography alone [5]. The slow development of arachnoiditis [7] and the relatively short survival of cancer patients after spinal compression [8] obviate withdrawal of the small amount of Pantopaque, which in the presence of a complete block might create a high risk. In addition, the retained Pantopaque can be used for follow-up examination of the spinal canal for patency after treatment.

In conclusion, our modified approach for a complete myelographic evaluation of the entire spinal canal for compression in cancer patients has proven to be safe, accurate, and time-saving. We believe this approach should be the method of choice in cancer patients until a noninvasive and more efficient imaging technique, hopefully MR imaging, becomes available.

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