A disquieting aura of clinical frustration commonly attends palliative efforts in patients suffering with perineal, perianal, or sacral pain from invasive pelvic malignancy. This pessimism derives variously from the destructive excesses of blind procedures, the inadequacies of compromising measures, and the dismaying complexity of existing methods of selective rhizotomy.

Certain of these patients, when no attempt to spare motor fibers is necessary, may benefit from a simple technique of sacral rhizotomy which furnishes the basis for this report.

Procedure

The patient is placed prone, or on his side, his legs wrapped with elastic bandages, and the back flexed, prepared, and draped. Through a midline lumbosacral incision the usual posterior approach is made. The overhanging tip of the L5 spine and the S1 spine, together with the upper edge of the sacrum, are rongeured away (Fig. 1). The ligamentum flavum is excised, the operative defect is enlarged, and the S1 and S2 roots are located. The heavy silk ligatures are passed extradurally with a right-angle clamp. The upper ligature is tied very tightly below the axillae of the S1 roots. The second ligature is tied as far caudal as possible. As the second tie is being drawn tight, an assistant punctures the fluid-filled sac between the ligatures (Fig. 1, insert). This is an important minor technical point, allowing the second ligature also to be tied tightly. Then the dural sac with all of its contents is divided between the ties. (If the ligatures are not tied correctly the nerve roots will retract and the sutures will slip off the severed dural end.) The spinal canal is packed with Gelfoam as needed for hemostasis, and the incision is closed in layers.

Selection of Patients

As a general rule, major neurosurgical procedures attempting to obtain relief from pain are done best only on patients with histologically proven, uncontrolled, malignant neoplasm. This is certainly true of such a destructive procedure as described above. Since motor function below the first sacral root is sacrificed, normal control of bowel and bladder would preclude use of this technique as illustrated. Accordingly, candidates for this type of sacral rhizotomy are indeed few in number. But it is a significant number. Many patients with cancer, at the time of neurosurgical referral, have had their alimentary and urinary tracts interrupted in the original attempt at surgical cure, or at a secondary higher shunting procedure because of blockage at a lower pelvic level.

In the past 6 years this type of sacral rhizotomy has been performed on 8 patients at the U. S. Naval Hospital, San Diego; the City of Hope, Duarte; the Huntington Memorial Hospital, Pasadena; and the San Gabriel Community Hospital, San Gabriel, California. The histologically verified pathological diagnoses were carcinoma of the rectum (3 cases), cervix (2 cases), bladder (1 case), anus (1 case), and 1 case of primary liposarcoma of the perineum. At the time of rhizotomy all 8 patients had functioning colostomies and 6 had either ileal urinary bladders or long-standing drainage by urethral catheter. All were reasonably good surgical risks and had a reasonable life expectancy. All patients were on large doses of narcotics. All were ambulatory. In all cases attempts at surgical cure had been exhausted, and cobalt irradiation and chemotherapy (including intra-arterial when indicated) had also been utilized or considered not to be indicated. At the time of rhizotomy uncontrolled metastatic disease or invasive malignancy was verified by biopsy or by roentgen-ray evidence in 6 patients. In 2 cases, at the time of rhizotomy, the intractable pain was attributed to recurrent tumor,
but postoperative and postirradiation inflammation was a possible cause.

**Operative Modification**

Before assessing results, even in this small series, there are two modifications of surgical technique that should be mentioned. The first 4 patients had only midline pelvic pain, and the procedure was performed exactly as illustrated. It was believed that pain in the lower extremity (sciatic radiation) was a contraindication to this type of sacral rhizotomy. Instead, the usual contralateral high thoracic chordotomy was used. While this controlled the pain in the lower extremity, the midline pelvic pain usually necessitated a chordotomy on the second side as well. The last 4 patients subjected to sacral rhizotomy all had unilateral sciatic radiation as well as pelvic pain, but sensory tests, motor power and electromyography showed no demonstrable organic involvement above the first sacral level. In addition to the rhizotomy as illustrated, these last 4 patients all had the S1 root on the painful side treated with silver clips and divided, or incorporated in the ligatures, at the time of the rhizotomy.

The other surgical modification was to spare a second sacral root in the 7th patient. He was physically very active in spite of his
colostomy, and had good preoperative urinary control. Severe sacral pain was present from invasive rectal carcinoma with destruction of bone. He also had unilateral sciatic pain. At operation the procedure was as illustrated, except the S1 root was divided on the painful side while the S2 root was spared on the opposite side. Following operation a Foley urinary catheter was left in place for 48 hours. Following its removal, the patient had good voluntary urinary control with no significant residual urine.

Results

Of the 8 patients, the last was operated upon too recently to make evaluation of the result valid. In the first 7 cases the results were excellent in 5, poor in 1, and an absolute failure in another.

The failure was in a woman with proven recurrent rectal carcinoma with midline pelvic and unilateral sciatic pain. Following rhizotomy she continued to complain bitterly of a severe burning pain and a feeling like a "hot mass" in her pelvis. She did not seem addicted, but did well on placebos at times. Finally a bilateral one-stage high thoracic chordotomy was done. This produced good thoracic sensory levels on both sides. The pelvic pain soon recurred in all its intensity. The psychological factors in this patient's suffering finally became evident, and she was maintained better on tranquilizers than narcotics for many months. Yet she became bedridden and refused to ambulate, even though she had good strength in her legs, because the "pain was made much worse" by the upright position.

The poor result was in a young woman with recurrent carcinoma of the cervix with pelvic and unilateral sciatic pain. Following operation she had good relief of her perineal pain, but only partial relief of her sciatic pain, although the S1 root had been divided on that side. Slowly the pain in the lower extremity again grew severe, and narcotics were reinstituted.

In the 8 cases there were no operative mortalities or serious complications. The morbidity from the procedure itself was surprisingly small. The residual of sacral anesthesia was well tolerated. The patients had been prepared preoperatively and were glad to "trade pain for numbness." In those cases in which the S1 root was cut, the expected loss of ankle reflex and weakness of plantar flexion caused no concern, although in 2 patients a definite limp was noted in the gait. In 1 of the first patients, in whom neither of the S1 roots was sacrificed, there was an unexplained difficulty with balance for a few days when starting ambulation, in spite of intact vibration and sense of position. This problem cleared spontaneously.

Discussion

Sacral rhizotomy as described is a relatively quick, simple neurosurgical procedure. Loss of blood usually is minimal. It can be done under general anesthesia with intratracheal intubation, but spinal anesthesia works very well. (In 2 early cases a low spinal anesthetic was used to be certain preoperatively that sacral rhizotomy would abolish the pelvic pain.) The patients are ambulated the night of operation or the following morning. (The operative site, however, is not in the anesthetic zone.) The alternative high thoracic chordotomy is a much more extensive procedure. In pelvic pain chordotomy usually needs to be done bilaterally, either in two stages or at one operation. The mortality and morbidity of chordotomy certainly must remain considerably higher than that in rhizotomy. If the spinothalamic tractotomy is too extensive, motor function to the contralateral extremity and ambulation are threatened. Yet the phenomenon of "sacral sparing" in bilateral chordotomy with failure of permanent relief of pain in cases of midline pelvic pain is a well known hazard if the chordotomy is not extensive enough. The use of destructive agents like phenol or alcohol injected into the subarachnoid space is subject to the same risk—failure of relief of pain in too small quantity or dilution, and risk to ambulation in higher concentration. Thus, the use of this simple technique of sacral rhizotomy for the alleviation of pelvic pain in ambulatory patients with uncontrolled cancer, when control of bowel is not a limiting factor, deserves consideration and further trial.