The Management of Chronic Interstitial Cystitis by Differential Sacral Neurotomy*

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In 1915, Hunner introduced his observations on ulcer formation in the summit of the bladder in the presence of interstitial cystitis with these words:

"I wish to present for your consideration this evening a group of cases in which the lesion differs from the so-called Fenwick ulcer which has been the type heretofore described as simple ulcer. This group presents a strikingly uniform picture, an appreciation of the features of which by our branch of the profession will save the patient from much suffering, both from errors in diagnosis and consequent futile operations on other organs, and from the unnecessary prolongation of ordinary cystitis treatment when more radical measures are demanded. ... There is nothing absolutely characteristic in the cystoscopic picture. Perhaps the most characteristic thing is the insignificance of the lesion as compared with the long duration and intensity of the patient's suffering."4,5

The pathological entity which Hunner described that evening has become known to us as a Hunner ulcer.

Intractable pain and urinary frequency are the most incapacitating features of chronic interstitial cystitis. Hypertonicity, urgency, incontinence, and concomitant reduction of bladder capacity characterize this chronic and disabling disorders. Far-advanced cases show a bladder capacity ranging from 30 to 80 cu cm.

Reduction of parasympathetic outflow to the detrusor and reduction of the sacral somatic outflow result in decrease of bladder hypertonicity and, secondarily, an appreciable increase of bladder capacity. This has been demonstrated experimentally;13 it has also been demonstrated in the clinical management of the neurogenic bladder.6-10 Based on this principle, differential sacral neurotomy was employed first in 1954 in the treatment of interstitial cystitis.12 In utilizing the same principle, Bohm and his associates have performed posterior sacral rhizotomy in cases of interstitial cystitis with resulting reduction of urinary frequency, reduction of pain, but without appreciable effect on bladder capacity.2 It appears then that anterior and posterior rhizotomy, or sacral neurotomy, rather than posterior sacral root section are required to achieve the necessary decrease in bladder tone with the concomitant increase in bladder capacity.

The etiology of the disease remains obscure. Bohm and his associates3 have described histologic changes in sacral nerves in the presence of interstitial cystitis, consisting of endoneural and perineural fibrosis, myelin sheath degeneration, round cell infiltration, and the appearance of granulation tissue. On the basis of clinical studies, they have suggested that sacral rhizopathy may represent the etiology of a variety of pathologic entities such as urethrovaginitis, prostatitis, interstitial cystitis, and coccygodynia.

Investigations have been carried out in dogs and monkeys.7 Sacral rhizopathy has been produced by application of aluminum gel or of lycopodium spores. The series of studies carried out in dogs was inconclusive. Studies carried out on monkeys were suggestive of an etiologic relationship between sacral rhizopathy and interstitial cystitis. Eight monkeys were subjected to lumbosacral laminectomy and application of lycopodium spores or aluminum gel to the sacral nerve roots. Five monkeys were used as controls. Preliminary cystoscopy was carried out on all 13 monkeys. The period of observation averaged 14 months. Four of the eight animals with sacral rhizopathy developed changes in the bladder, consisting of thicken-
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...ing of the lamina propria due to edema, round cell infiltration, and submucosal fibrosis. There was no frank ulceration. None of the bladders of the control group showed any histologic changes.

There is, then, to date no conclusive answer to the question whether sacral neurotomy, or rhizotomy, has a beneficial effect on the signs and symptoms produced by interstitial cystitis in man because of the resulting increase in bladder capacity or because of elimination of diseased nerve roots. In our own cases of interstitial cystitis, we have not found any histologic changes in the sectioned sacral nerves. Observations made by Bohm and his associates, and results of studies on monkeys, are sufficiently interesting to warrant further investigations of the etiologic role which sacral rhizopathy may play in the production of Hunner ulcer.

Clinical observations have established that differential sacral neurotomy, or anterior and posterior sacral rhizotomy, have a beneficial effect on the symptoms produced by interstitial cystitis in man. The question remains whether this effect is the result of reduction of parasympathetic and sacral somatic outflow, or is due to elimination of impulses to the bladder travelling by way of pathologically altered nerve roots.

Clinical Management

It is essential to bring patients with Hunner ulcer to neurosurgical attention prior to development of bladder wall fibrosis which would prohibit any appreciable increase in bladder capacity. Preliminary studies include determination of bladder capacity, urinary output with each micturition, continence, and the amount of residual urine.

The potential of bladder capacity can best be determined under spinal anesthesia with a level caudad to L-1. Patients with a sufficient degree of bladder wall fibrosis, prohibiting any appreciable increase in bladder capacity, should be excluded from consideration for differential block studies and sacral neurotomy. While a bilateral block of S-3 yields the best results in the majority of the cases, test block of S-2 and possibly S-4 should be carried out. In some instances a combination block of S-2 and S-3 may have to be done. In isolated cases, bilateral blocking of one pair of nerve roots, and unilateral blocking of an additional root may be indicated.

When first doing sacral block studies some 20 years ago, we depended on measurements relating the position of the sacral foramina to the posterior superior iliac spine. Since then it has become increasingly clear that some of our failures then were due to technical errors. Dr. Joseph H. Allen has worked out a fluoroscopic technique for the localization of posterior sacral foramina which has made it possible to perform differential sacral block studies with dependability. After frontal and lateral sacral views have been taken, lead arrows are placed under fluoroscopic control at the lateral margin of the lateral sacral crest overlying each posterior sacral foramen. Accurate position of the markers is verified by another set of frontal and lateral films. Number 20 gauge spinal needles are then introduced into the posterior foramina. The presence of branches of the lateral sacral arteries in the posterior foramina necessitates aspiration prior to injection. So as to prevent flooding, not more than 1 cc of 1% xylocaine is injected into each foramen. The needle is then withdrawn. Bladder studies are carried out within 45 minutes of the onset of the block.

Cases developing urinary incontinence while the block is effective should be eliminated from consideration for differential sacral neurotomy. The residual urine should not exceed 60 cc. In making final selection of cases suitable for neurosurgical intervention, it is well to remember that the block is never quite as effective as the actual neurotomy. Nevertheless, the block is a dependable indicator of the potential improvement that may be achieved with differential sacral neurotomy. Whenever the bladder capacity increases under the block by 100 to 200 cc, one may safely assume an even greater increase following neurotomy.

Operation is carried out by midline incision permitting exposure of the sacral foramina by use of self-retaining retractors. The foramen is enlarged with a Kerrison punch. Each sacral nerve is picked up with two blunt hooks and divided. Three characteristic cases are described below.

Case 1. This patient, first reported in 1956, began to develop increasing urinary