Neurological Deficits Associated With Pelvic Fractures

CHARLES L. GOODELL, M.D.*

Section of Neurological Surgery, Department of Surgery, Indiana Medical Center, Indianapolis, Indiana

DISTURBANCES of neurological function are an uncommon complication of pelvic fractures and reports in English have been rare. Neurological data accompanying these few published cases is generally fragmentary and hardly adequate for drawing more than tentative conclusions regarding the mechanism and site of the peripheral nerve injury.

Lam7 surveyed the literature and found mention of nerve injury in 0.75 per cent of 1889 pelvic fractures, but encountered 9 nerve injuries in his series of 100 cases. Bonnin9 described associated nerve injuries in 11 per cent of his 44 patients. More recently, Patterson and Morton10 reported neurological complications in 1.2 per cent of 800 pelvic fractures. Reasons for this more than tenfold disparity between rates of neurological complications are not obvious.

No pattern of pelvic ring fracture seems to predominate in instances where nerve damage has occurred. However, nerve deficits appear to be more common with fractures of the sacrum than with pelvic fractures not involving that structure. Further comment will be made on this phenomenon later in the article. Patterson and Morton10 reported sacroiliac joint separation in over half of their patients with neural damage; sacroiliac subluxation, however, occurs in only 6 per cent of unselected pelvic injuries.9

We have recently encountered 3 cases of nerve injury complicating pelvic fractures. All have undergone careful neurological evaluation, myelography, and surgical exploration. The data from these cases have increased our understanding of the nature and site of the neural damage.

Case Reports

Case 1. A 21-year-old white man was transferred to the Indiana University Medical Center 6 hours following an automobile accident. Immediately following the injury, he had been taken to another hospital where he was found to be lethargic, "somewhat shocky," and to have a deep laceration in the right buttock. Initial examination of this wound had allowed palpation of blood vessels between the sacrum and ilium. After profuse bleeding from the laceration was controlled by packing, an abdominal exploration was undertaken. Intraperitoneal and retroperitoneal hematomas were found but no bleeding point was identified. The patient was transferred to our hospital.

Examination. The patient was lethargic and the vital signs were within normal limits. He moved his legs and arms normally. A urethral catheter was in place. X-rays showed a compression fracture of the 13th thoracic vertebra and a comminuted transverse fracture of the sacral body with anterior displacement of the fragments.

Several days after admission, the urethral catheter was withdrawn but required replacement because the patient was unable to void. By this time he was alert, but had developed fecal incontinence and did not feel bladder fullness. He described numbness in his buttocks and both heels. Detailed neurological examination at this time revealed normal strength in all muscle groups in the legs. Knee jerks were brisk but only trace ankle jerks could be elicited. The bulbocavernosus reflex was absent. The anal sphincter was flaccid. There was a gibbus at T-12 and percussion of this area caused pain and "numbness" in his legs as well as an "electric sensation" down the spine. Sensation was diminished in the S-2, S-3, and S-4 dermatomes (Fig. 1). Several days later myelography was performed. There was a slight anterior indentation of the dural column at the site of the vertebral fracture, and the inferior margin of the dural sac within the sacrum was noticeably irregular.

Operation. A laminectomy of T-10 to L-2 was undertaken. The distal cord segments and nerve roots which originated from it were found to be normal. Although there was a hard ridge on the floor of the spinal canal at the T-12 level, the spinal cord was not compressed. A laminectomy of L-5 through S-2 was immediately performed. A hematoma 3 mm. in thickness was found in the epidural space at the S-2 level. At the S-3–S-3 level the sacrum was fragmented and the distal sacral segments were angulated 90° anteriorly. Both S-4 roots and the right S-3 root had been torn. Proximal stumps of these nerves were identified but the distal ends could not be found. The left S-3 root

Received for publication June 18, 1965.
Revision received January 14, 1966.
* Address: 2810 Ethel Street, Muncie, Indiana.
was ragged, stretched, and thin, but still in continuity.

Postoperative course. Three weeks later the urethral catheter was withdrawn and the patient established a normal voiding pattern. Repeated catherization yielded no residual urine. Although the anal sphincter remained flaccid, the patient regained continence. One year following his injury the patient had normal bowel and bladder function. He is able to achieve erection and ejaculation.

Comment. This patient had an injury of the lower sacral roots at a level where they still lay within the sacral canal. There was extensive fragmentation of the lower portion of the sacral body below the alar processes; no other pelvic fractures were present. Among sacral fractures, this transverse comminuted type is unusual.3 The traumatic forces acting on the sacrum must have been applied directly and not by crush or sheer stresses acting elsewhere on the pelvic ring. As comminution and displacement occurred violently, the sacral roots passing through the fracture site were literally torn apart.

Meyer and Wiltberger8 reported 2 similar injuries. Their patients complained of sacral and posterior thigh pain and were unable to void, but had “no neurological deficit.” Both patients were improved by surgical decompression of the S-2 nerve roots. In one the roots were tented and partially lacerated.

Most sacral fractures are caused by sheer and rotational stresses transmitted throughout the pelvic ring at the time of impact or crushing.9 Indirect sacral injuries of this sort are usually associated with at least one other pelvic fracture. Sacral fractures of this type are generally non-comminuted and commonly involve the alar process, passing through one or more foramina. Minimal displacement sometimes occurs. The most commonly reported neurological deficit complicating indirect sacral fracture is weakness of the glutei, hamstrings, and plantar flexors.3,5,7,10 Cutaneous sensory deficits involved various areas of the buttock, posterior aspect of the lower limb, and lateral aspect of the foot. Loss of power in the quadriceps, dorsiflexors and intrinsic muscles of the foot have been described as occurring in various combinations with the S-1 myotomal deficit.

Case 2. A 22-year-old white man fractured his pelvis and right leg in an automobile accident 4 years prior to admission to Indiana University Medical Center. Separation of the symphysis pubis and right sacroiliac joint had occurred. Since the injury, he had had considerable weak-