Sacrum fractures and neurological damage

Report of two cases

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Two cases are presented in which automobile collision caused transverse sacral fracture involving neurological elements. The patients were admitted within 2 weeks of each other to the Maryland Institute for Emergency Medicine. An attempt was made to assess the incidence of this condition and its relation to fractured pelvis. A literature search was conducted, and several points of diagnosis and management are discussed.

KEY WORDS • spinal injury • sacrum • sacral fracture • spinal nerve root • neurogenic bladder

In almost 1000 cases entered in the 1972 National Spinal Injury Registry, there are no isolated sacral fractures. In our Institute for Emergency Medicine, approximately 1200 patients with multiple trauma are admitted each year, yet we have not handled such a case before this year. In the neurosurgical literature we can find no reports of such cases. In the world literature they appear only sporadically. Consequently, when two such cases with neurological deficit were admitted within 2 weeks to our institute, we reviewed the problem in order to proceed with the best possible therapy.

The literature suggests that these fractures can occur associated with pelvic fractures, but slightly more than half occur as the only fracture. Of the two cases we report, one was an isolated fracture and one was associated with a broken pelvis.

The neurological abnormalities that occur with sacral fractures are presumably the result of damage to sacral nerve elements. In the past case reports, perianal motor and sensory loss, and bladder and anal sphincter disturbance did occur, but rarely. Such deficits were a problem in both our cases.

Case Reports

Case 1

This 21-year-old woman was apparently asleep in the right front seat of a car at the time of a head-on collision. She subsequently stated that she always wears a seat belt, and it was assumed that she was wearing one at the time of her injury.

Examination. On admission, she was unconscious with a closed head injury. She required laparotomy for a ruptured spleen, at which time a large retroperitoneal hematoma was seen. There was moderate ecchymosis in the area of her vulva and perineum. Initial anteroposterior pelvic x-ray film was normal,
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FIG. 1. Case 1. Lateral sacral radiograph showing the fractured sacrum (arrows).

FIG. 2. Case 2. Lateral sacral radiograph showing the transverse fracture (arrows).

apart from a partial spinal bifida occulta of L-5.

After several days the patient awoke and became cooperative. When the urinary catheter was removed, she was unable to micturate, and a lateral pelvic x-ray film revealed a fractured sacrum at the S1-2 level (Fig. 1). In 5 days she was awake enough to cooperate with a full neurological examination. It became obvious that she had a perianal anesthesia from S-2 down and a lax anal sphincter, and that she was unable to micturate. A cystometrogram supported diagnosis of fractured sacrum with complete cauda equina dysfunction below this level. Rectal digital examination was not painful even when attempts were made to mobilize the fractured sacrum. The sacrum was immobile and presumably impacted. We believed that all attempts must be made to correct this functionally devastating situation and that her treatment should be similar to that for a peripheral nerve injury.

Operation. A sacral deroofing procedure, or "sacral laminectomy," was performed and the cauda equina was exposed. The angulated impacted fracture was confirmed. The cauda equina was found to be traumatized, but no elements were apparently sectioned. The operation apparently effected some decompression. There was no sharp angulation in front of the neural elements nor were they being stretched over a gibbus. The wound was closed without drainage and healed well.

Postoperative Course. There was no immediate neurological improvement. However, a repeat cystometrogram 10 days later showed a subjective improvement, in that the amount of saline infused into the bladder without discomfort decreased from 450 ml to 200 ml. The patient's other injuries progressed satisfactorily, and 3 weeks after surgery she was transferred out of state, close to her home. A recent telephone conversation with both the patient and her neurologist indicates that no neurological improvement has occurred in the 9 months since her injury.

Case 2

This 19-year-old man was a passenger in a car involved in a head-on collision. He was not wearing a seat belt.

Examination. On admission, he was awake and alert. There was a fractured pelvis involving the left ilium and pubis and transverse fracture in the sacrum at approximately the S2-3 level (Fig. 2). There was
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no perineal ecchymosis, and a neurological sensory examination of the area revealed no abnormality, although there was a suggestion of a lax anal sphincter. Rectal examination was extremely painful, but no mobility was noted in the distal fragment of the sacrum. In spite of the virtually normal neurological examination, the patient was unable to micturate when the catheter was removed. A cystometrogram confirmed neurogenic retention. However, because sensation was intact, surgery was considered unwise.

Course. During the next 10 days the patient began passing urine spontaneously and was discharged from the hospital soon after. There was no residual urine present on measurement; he had apparent full neurological recovery. Recent examination confirms this. Apart from occasional mild pelvic discomfort, he is asymptomatic.

Review of the Literature

Searching for previous reports of such cases, we found little in the last 40 years, especially in the English language.

Malgaigne, in his classic monograph Traité des Fractures et des Luxations, stated that a sacral fracture occurred only once in 2358 patients at the Hotel-Dieu, Paris. He makes no mention of the neurological abnormalities.

Both Ghilardi and Ettore (quoted by Favuzzi) gave an incidence for isolated fractures of the sacrum at less than 0.1% of all fractures (six in 7000). Macciocchi found that 31 of 52 cases (60%) of sacral fractures were isolated. Three cases described in 1938 by Hallgrimsson had as the chief symptoms pain and dysuria and difficulty with defecation. None of his patients had definite neurological signs, which he considered rare. He noted the difficulty of diagnosing sacral fractures on x-ray film due to their position and obliquity and suggested that the beam be angulated up 50° from the horizontal.

In 1945, Bonin mainly referred to a totally different fracture, a longitudinal one associated with pelvic fractures in which the ring was broken. Some unilateral numbness was the only neurological deficit and there was no bowel and bladder dysfunction. He did, however, mention transverse fractures, stating that they are due to direct trauma, as opposed to indirect trauma which caused the longitudinal fracture.

In 1969, Purser reported a case of a young girl with a sacral fracture that was really a slippage of S-1 on L-5, which he stated could easily have been missed had another fracture of the transverse process of L-5 not been seen. No neurological abnormalities were mentioned. Woodward and Kelly reported a similar case, which they termed "traumatic spondylolisthesis." They stated that due to normal maturation this particular condition cannot occur after the age of 25 years when full fusion occurs.

Rowell reviewed the literature and added a case of his own, a compound longitudinal sacral fracture with cerebrospinal fluid leak. He stated that sacral fractures always involve the lower three segments, as in our second case. He believed that the upper two sacral vertebrae are thicker and more resistant, being solidly placed between the sacroiliac articulations. Our first case contradicts this concept. He added that there is usually no displacement, but anterior angulation is commonly visible on lateral radiographs, as in both our cases. The complications, he stated, may be vascular from presacral hematoma, caudal equina lesions, or sacral nerve damage. Viscera in the rectum may be injured if the fracture is compound.

Discussion

It was surprising to have encountered within 2 weeks two patients with similar and unusual injuries, both with neurological dysfunction. It is probably true that we were alerted to the second one by having had the first, which was not diagnosed for several days.

Although both our patients had good lower limb function, the first patient suffered a serious neurological lesion, resulting in the inability to control bladder or bowels and presumably the loss of tactile sexual function, the latter being confirmed on a recent telephone conversation with her. It was felt that little was to be lost by attempting decompressive surgery. The second patient's lesion was obviously incomplete, as sensation and some anal tone remained and he recovered without surgery.

Although both our patients had similar injuries, there were significant differences. The first patient had a high sacral lesion, S1–2. There was perineal ecchymosis and no pelvic
fracture; she had a complete lesion and was apparently wearing a seat belt. We theorized that her pelvis was held while she had flexed acutely, and the broken automobile seat inflicted the direct trauma. Our second patient had a lower (S2-3) sacral fracture, with a pelvic fracture; he was not wearing a seat belt, and his neurological lesion was not complete. The most significant difference to date is that our second patient has apparently recovered, while our first patient has not, although there has been some apparent cystometrographic improvement.

This condition may be somewhat more common than previously supposed and should be actively sought in any patient who has suffered obvious direct trauma to the buttocks, is unable to micturate for no apparent reason soon after pelvic trauma, and has perineal ecchymosis. Sensory examination and testing of anal sphincter tone, as well as cystometrography, will help define the problem. Even when routine pelvic or spine films are normal, special films should be taken to prove the diagnosis. However, we can make no strong recommendation as to the best treatment to reverse the neurological deficit.

Fractures of the sacrum with resultant neurological deficit are uncommon. We feel the condition can be best diagnosed by awareness of the problem, diligence in seeking perineal signs in pelvic trauma, and persistent radiological attempts to identify it.

References

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