Lumbopelvic fixation for sacral fracture-dislocations

Jan Lindahl

Helsinki University Central Hospital, Helsinki, Finland

**Purpose**

Sacral fracture dislocations that result in spino-pelvic dissociation are usually combinations of bilateral longitudinal transforaminal sacral fractures with an associated transverse sacral fracture. These injuries result in dissociation of the spine and upper central segment of the sacrum from the pelvic ring and caudal sacral segments. Nonoperative and a variety of surgical methods have been used for treatment for fracture dislocations of the sacrum, but the treatment is still controversial. The segmental spinal fixation techniques with distal fixation points at the posterior part of iliac wings has offered an opportunity to reduce and stabilize type H sacral fracture dislocations. The purpose of this prospective study was to evaluate the results of operative reduction and lumbopelvic fixation of patients with high-energy sacral fracture dislocations with spinopelvic dissociation and neurologic deficits.

**Patients**

During a 15-year period, 22 consecutive patients with Roy-Camille et al. (1985) type 2 or type 3 comminuted bilateral vertical and horizontal sacral fractures with spinopelvic instability and cauda equina deficits and/or lumbosacral plexus injury, were treated with segmental lumbopelvic fixation. Fifteen of the patients had also an anterior injury to the pelvic ring. There were three concomitant acetabular fractures. Two were open fractures with extensive perineal wound into the pelvis. One patient had an unstable thoracic (th XII) fracture with spinal cord injury and paraplegia, and four other patients a lumbar burst fracture with cauda equina injury and paraparesis. The mean injury severity score (ISS) was 41 (18-66) (Greenspan et al. 1985). Twelve of the patients were females and ten males with a mean age of 32 years (range, 15-59). One patients was included in the analysis of early complications and radiographic result, but was excluded from the functional and neurological outcome analysis. All patients had high-energy trauma.

**Methods**

Injuries of the anterior part of the pelvic ring were most commonly operated on first. The method for lumbopelvic fixation included two pairs of lumbar pedicle screws, and two pairs of iliac screws. Longitudinal rods were connected to the lumbar pedicle screws. Two transverse connecting rods between longitudinal rods were used to secure the fixation. Operative reduction, correction of antero-posterior and vertical displacement, and rotational deformity, was carried out by using bilateral AO-reduction clamps. Five patients had sacral decompression. Radiographic results of treatment were evaluated (Lindahl et al. 1999). Sacral kyphotic angulation was measured from lateral sacral radiographs and/or sagittal CT reformations by drawing lines along the posterior sacral cortices of the adjacent fragments inferior and superior to the transverse fracture. Translation of the transverse sacral fracture was determined from these same views by measuring the displacement of the posterior cortex of the sacrum above and below the transverse fracture. All the patients had a clinical examination with particular attention to their gait, hip motion, difficulties in sitting, and persistent motor and sensory nerve deficiencies. The residual pain was graded as: no pain, mild (intermittent, normal activity), moderate (limits activity, relieved by rest), and severe (continuous at rest, intense with activity). The functional outcome was measured using a scoring system described by Majeed (1989) and modified by Lindahl et al (1999), which is based on the clinical findings.
Results

The mean time from injury to definitive surgical treatment was 11 days (range, 0-34). One patient (5%) was operated within 24 hours of injury, one patient (5%) between 24 and 48 hours after injury, 15 patients (80%) between 48 hours and 21 days after injury, and 2 patients (10%) later on. Radiological end results of bilateral longitudinal transforaminal sacral fractures were excellent or good in all cases. Overall preoperative sacral kyphosis was 43° (range, 0°-90°), and final kyphosis 21°. In five patients final sacral kyphosis was 30 degrees or more. There was no secondary loss of reduction. Functional outcome was excellent in 3, good in 10, fair in 2, and poor in 6 patients. All patients except one, who had spinal cord injury and paraplegia because of unstable thoracic fracture, showed at least some evidence of neurologic recovery. Complications were rare: loss of reduction 0, malunion (displacement > 10 mm) 0, nonunion 1, deep wound infection 0, superficial wound infection 1, and breakage of hardware 5 (these were seen after bony healing and did not lead to redisplacement or deformity of the sacral fracture).

Conclusions

The initial diagnosis of these fractures might be difficult. Sacral fracture-dislocations with spino-pelvic instability should be suspected in patients who jump or fall from heights. Early lateral sacral radiographs and pelvic sagittal CT reformations show the injury. In this series radiological end results of bilateral longitudinal transforaminal sacral fractures were excellent or good in all cases. Lumbopelvic fixation provided sufficient stability for bony union without loss of reduction, but the reduction and stabilization of the transverse sacral fracture is still problematic. It is important to place the longitudinal rods and clamps as close as possible to the dorsal surface of the sacrum and medial, but not posterior, to the posterior superior iliac spines to avoid wound-healing problems. All patients except one who had thoracic fracture with spinal cord injury showed at least some evidence of neurologic recovery. The indications for surgical decompression remain unclear.
Figure 1 (C-F) He was operated by reducing and fixing the sacral fractures with segmental lumbopelvic fixation and sacral decompression.