



Clinical Study

Reliability and effectiveness of percutaneous sacroplasty in sacral insufficiency fractures



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ABSTRACT

We evaluated the clinical results of sacroplasty for sacral insufficiency fracture (SIF). SIF are rare fractures that present as low back and groin pain. The diagnosis of SIF is difficult and sacroplasty is the last line of treatment. We reviewed the clinical and radiological data of 15 patients who underwent sacroplasty. Fifteen patients were selected, 12 women and three men, all of whom had failed to respond to medical therapy and bed rest, and were aged 39–76 years (mean 65.7). A retrospective electronic medical record review and face-to-face or phone interview was conducted. The patients' pain was assessed using the visual analogue scale (VAS) and functional status was assessed using the Oswestry disability index (ODI). Radiological diagnoses and investigations were performed using sacral CT scans and MRI. The sacroplasty procedures were performed using the short axis technique. The preoperative VAS scores (mean $\pm$ standard deviation) were reduced from 7.6 ± 0.7 to 1.7 ± 0.7 postoperatively ($p < 0.05$). The preoperative ODI was also reduced from an mean of 44 (range: 38–46) to 14 (11–22) postoperatively ($p < 0.05$). Sacroplasty is an effective and safe procedure to relieve pain due to SIF.

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1. Introduction

Sacral insufficiency fractures (SIF) are rare fractures which involve the sacral wing. SIF most frequently occur as a result of osteoporosis, calcium metabolism disorders, radiotherapy and bone metastases [1], and are most common in postmenopausal osteoporotic women [2].

Lumbar and groin pain are the most common symptoms of SIF, particularly in an aged population, and because of similar symptoms that present in degenerative lumbar spine disorders, SIF is often misdiagnosed [3]. Therefore, diagnosis requires an initial suspicion and subsequent diagnostic workup that focuses on both the lumbar spine and sacrum, including a bone density test, bone scintigraphy, lumbar and sacrum CT scans and MRI [4].

The conservative treatment of SIF includes analgesics, bed rest, and sacral orthoses [5]. Patients who are unresponsive to this management and who have intractable pain are candidates for sacroplasty, a type of vertebroplasty.

Sacroplasty, a percutaneous technique, involves injection of cement into the sacral wings to relieve SIF-related pain. Although there are some studies on sacroplasty effectiveness for SIF, it has not been a popular treatment because of the lack of knowledge regarding SIF symptomatology, diagnosis and treatment.

The aim of this study was to review the clinical and radiological data of patients with SIF who underwent sacroplasty in our clinic.

2. Materials and methods

Sacroplasty was performed in 15 patients. The main criteria for sacroplasty was severe groin pain, secondary to osteoporosis-related SIF, that was resistant to conservative treatment. Patients with SIF secondary to osteolytic tumors were excluded from the study.

Diagnosis was performed based on clinical and radiological findings (lumbar and sacral CT scans and MRI). The demographic data, length of hospitalization, pre- and postoperative (early postoperative, 24 hours, 6 months and 1 year follow-up) data, pain severity, functional status, and complications were reviewed. Pain severity was assessed using the visual analog scale (VAS), and functional status was measured with the Oswestry disability index (ODI). ODI was calculated with the following formula: $ODI = (\text{patient total score} / \text{total raw score possible}) \times 100$.

2.1. Surgical procedure

The sacroplasty procedures were performed on an operating table that was appropriate for both anteroposterior and lateral fluoroscopy. Patients were positioned in the prone position. The

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percutaneous sacroplasty procedure was performed under local anesthesia and sedation. A skin incision was made 1.5 cm medial and superior to the bone entry point, the inferolateral point of the L5–S1 facet joint. The working cannulas were positioned in a similar position as that used for S1 sacral wings.

Cannulas were placed unilaterally or bilaterally according to the fracture, as assessed with the short axis technique under the guidance of biplanar C-arm fluoroscopy in standard sterile conditions. After the final positioning of the working cannulas was achieved and prior to administering the cement, biopsies were taken from all patients. Then, 3–5 cm³ of cement was applied to each side. All patients were postoperatively evaluated with sacral CT scans to view the cement distribution and check for sacroiliac joint cement leakage (Figs. 1–7). The patients were mobilized 2 hours after the procedure and discharged, on average, 24 hours postoperatively.

2.2. Statistical analyses

The mean difference between pre- and postoperative VAS was calculated, postoperatively at 6–24 hours and at the last follow-up. The Wilcoxon signed rank test was used to compare preoperative, postoperative and last follow-up data. The significance level for all tests was set at 0.05.

3. Results

Between the years of 2008 and 2013, sacroplasty procedures were performed on 15 SIF patients (12 women and three men) in our clinic. The mean age of the patients was 65.7 years (range: 39–76; Table 1). The main SIF symptom was severe groin pain, intractable to conservative treatments. The mean symptom duration was 3.7 months (range: 1–8).

Preoperative lumbar and sacral CT scans and MRI revealed a degenerative lumbar spine in 14 patients (93.3%), two of whom had a history of surgery for their degenerative lumbar spine. There was concordance between clinical symptoms and radiological findings in all patients. MRI with short tau inversion recovery (STIR) sequence showed bone marrow edema in all patients. A fracture line could be detected in six of 15 patients on MRI. Coronal and axial sacral CT scans showed a fracture line in Denis zone 1 and 2. SIF were found to be bilateral in 13 patients and unilateral in two.

The mean preoperative VAS score (mean $\pm$ standard deviation) was 7.9 ± 0.7 . This was reduced to 1.7 ± 0.7 , 2.0 ± 0.8 , and 2.4 ± 0.8 at 6 hours, 24 hours and 12 months postoperatively, respectively. These changes in VAS were statistically significant ($p < 0.05$; Table 2; Fig. 8). The mean preoperative ODI score also reduced from 44 (range: 38–46) to 14 (range: 11–22), 12 months

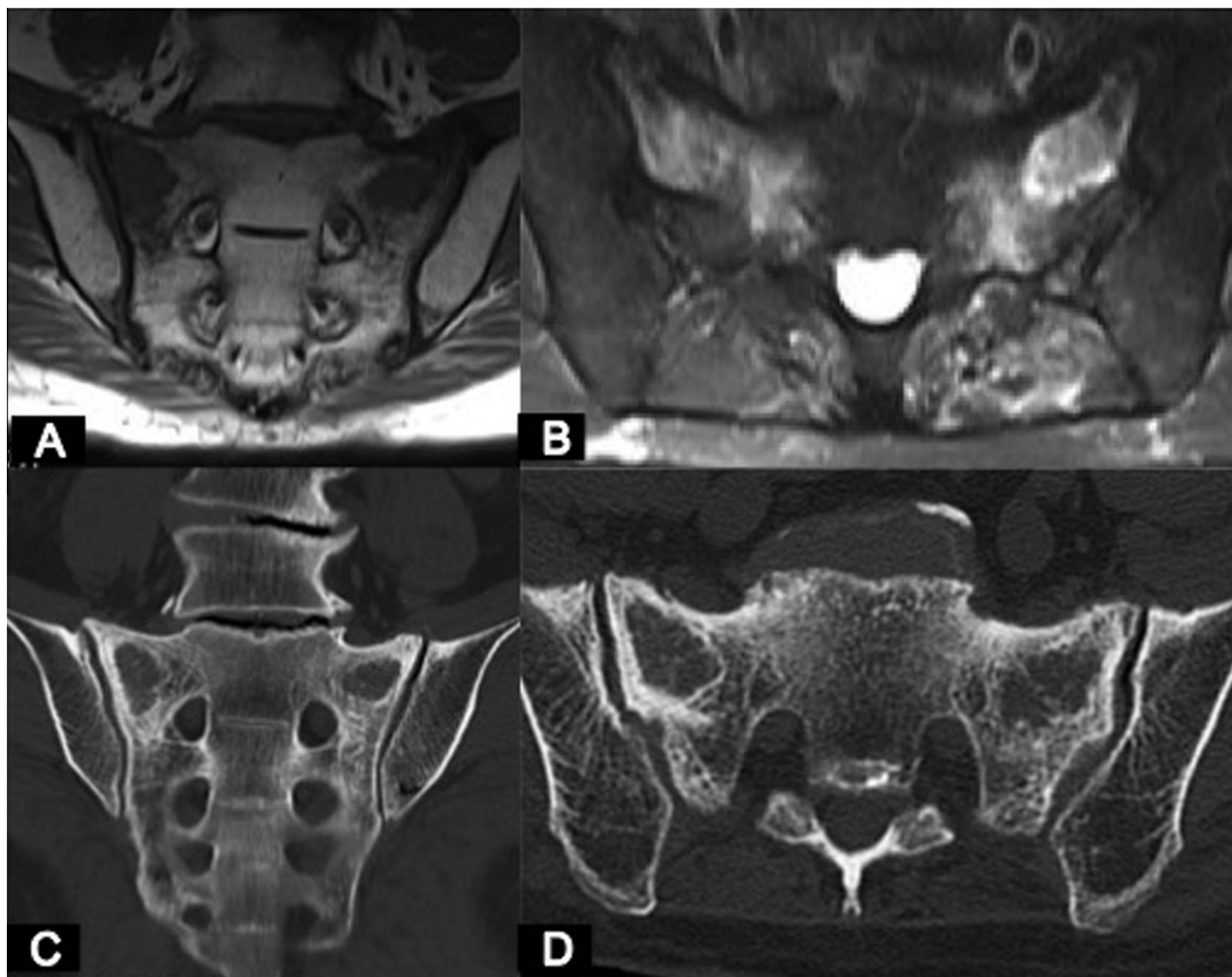


Fig. 1. Pelvic MRI and CT scans of a 68-year-old woman with advanced osteoporosis. (A) Coronal T1-weighted and (B) axial short tau inversion recovery MRI of the bone surrounding the bilateral sacral alar insufficiency fracture. (C) Coronal and (D) axial sacral bone CT scans showing the bilateral sacral alar area of sclerotic hyperdense signal representing the sacral alar insufficiency fracture.

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