CLINICAL STUDY

Clinical Impact of Sacroplasty on Patient Mobility

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ABSTRACT

Purpose: To evaluate the effect of sacroplasty on patient mobility and pain when performed as a treatment for sacral insufficiency fractures.

Materials and Methods: Imaging with computed tomography (CT), magnetic resonance imaging, or bone scan confirmed the diagnosis of sacral insufficiency fractures. Baseline clinical mobility scale (CMS) score and visual analog scale (VAS) pain score were recorded. Sacroplasty was performed under CT guidance. Follow-up CMS and VAS scores were assessed at 4, 24, and 48 weeks.

Results: Eighteen elderly patients (age 80 y ± 8.5; 17 women) were treated. Repeated-measures analysis of variance was conducted to assess changes in CMS and VAS scores over time. Pairwise comparisons revealed a significant increase in average CMS score between baseline and all three follow-up points—4 weeks ($P < .001$), 24 weeks ($P < .001$), and 48 weeks ($P < .001$)—indicating improvement in mobility over time. Pairwise comparisons revealed significant differences in mean VAS scores between baseline and all three follow-up time points—4 weeks ($P < .001$), 24 weeks ($P < .001$), and 48 weeks ($P < .001$)—indicating improvement in overall pain level over time.

Conclusions: Treatment with CT-guided sacroplasty for sacral insufficiency fractures in this elderly population resulted in significant improvement in patient mobility.

ABBREVIATIONS

CMS = clinical mobility scale, RMANOVA = repeated-measures analysis of variance, VAS = visual analog scale

Sacral insufficiency fractures are a relatively underdiagnosed cause of low back, hip, groin, and leg pain. They are the result of a normal stress on weakened bone and occur most commonly in older women with osteoporosis (1). Additional risk factors include steroid use, rheumatoid arthritis, multiple myeloma, Paget disease, renal osteodystrophy, hyperparathyroidism, and pelvic radiation (2). Often, the inciting trauma is not known or is minor, and the diagnosis is delayed. Historically, the treatment has consisted of bedrest, antiinflammatory medications, narcotic agents, and gradual mobilization (3).

Sacroplasty (or sacral osteoplasty) is an image-guided percutaneous treatment that involves the injection of cement into the sacral ala. The procedure was first described as a treatment for sacral insufficiency fractures in 2002 (4). Computed tomography (CT)–guided sacroplasty was first described in 2005 and has been discussed in multiple subsequent papers (5–7).

Although there is literature supporting the safety and efficacy of the treatment with regard to pain relief, there is a relative paucity of data regarding the effect on patient mobility (8–11). There are limited data on mobility assessments obtained before and after sacroplasty (12). The implications of improved mobility within the elderly population are substantial and include reduction in morbidity and mortality, improved quality of life, and decreased health care expenditures (13–17). The goal of the present study was to assess the mobility and pain levels in patients with sacral insufficiency fractures before and after CT-guided sacroplasty.

MATERIALS AND METHODS

Study Population

The institutional review board granted an exemption for the present study because it was a retrospective review of anonymous previously collected data. All patients with a benign sacral insufficiency fracture diagnosis (inpatient

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and outpatient) at a single institution over a 15-month period (April 2011 through July 2012) who had not previously undergone sacroplasty were eligible for this study. Eighteen elderly patients (mean age, 80 y ± 8.5 [standard deviation]), including 17 women, were included in the study. Two patients for whom a complete preoperative assessment was not recorded were excluded.

All patients underwent preprocedural imaging to confirm the diagnosis of sacral insufficiency fractures. Imaging was conducted by bone scan, magnetic resonance (MR) imaging, CT, or a combination of these procedures.

Patients with a confirmed sacral insufficiency fracture diagnosis were evaluated for baseline mobility and pain by using the clinical mobility scale (CMS) (18) and a visual analog scale (VAS) (19), respectively. There were no exclusion criteria for the treatment of sacral insufficiency fractures that were confirmed on imaging. For any patients receiving anticoagulation treatment, anticoagulation was held and the International Normalized Ratio was allowed to normalize (to < 1.5) before sacroplasty.

Following treatment with CT-guided sacroplasty, patients were reassessed (in person or via telephone) at 4, 24, and 48 weeks after the procedure for mobility and pain. Three patients died of unrelated causes before the final 48-week follow-up. Data were collected prospectively as part of standard practice within the department. Existing data were subsequently anonymized and reviewed retrospectively.

Measures

The CMS was used to assess a patient's degree of mobility over time. CMS measures eight parameters of mobility, including upright posture, walking, gait, sitting, stair climbing, handheld appliances, wheelchair, and time use. Each parameter is given a score from 0 (low mobility) to 3 (high mobility). All eight parameter scores are then summed for a total mobility score. Total mobility score can range from a minimum score of 0 (least mobile) to a maximum score of 24 (most mobile). Baseline CMS scores were obtained before sacroplasty was performed. Follow-up CMS scores were collected in person (at a follow-up office visit with an interventional radiologist) or via telephone by an interventional radiologist or radiology resident at 4, 24, and 48 weeks after the procedure.

The VAS was used to assess a patient's degree of pain. The VAS contains one question that asks patients, "On a scale of 0 to 10, with 0 being no pain and 10 being the most severe pain you have ever had, where is your pain level now?" Baseline VAS scores were obtained before sacroplasty was performed. Follow-up VAS scores were collected in person (at a follow-up office visit) or via telephone by a clinical staff member at 4, 24, and 48 weeks after the procedure.

Procedure

Following a discussion of the risks and benefits of, and alternatives to, the procedure, informed consent was obtained from all patients or from a durable power of attorney. The procedure was performed under conscious sedation that consisted of fentanyl and midazolam. Sedation was monitored by an interventional radiology nurse. Patients were positioned prone on the CT scanner, and a grid was placed over the sacrum (**Fig 1a**). Local anesthesia (1% or 2% lidocaine) was administered. With CT fluoroscopic guidance, a total of four needles (11- or 13-gauge Osteo-Site Murphy Coaxial Bone Access Needle; Cook, Bloomington, Indiana) were placed, two in each sacral ala, by using a short-axis technique (10). Needle size was based on operator preference. The target for needle placement was within a visible fracture plane, with the tip immediately posterior to the anterior sacral cortex. Two needles were placed at each of two levels within the sacrum. The exact levels of the needles

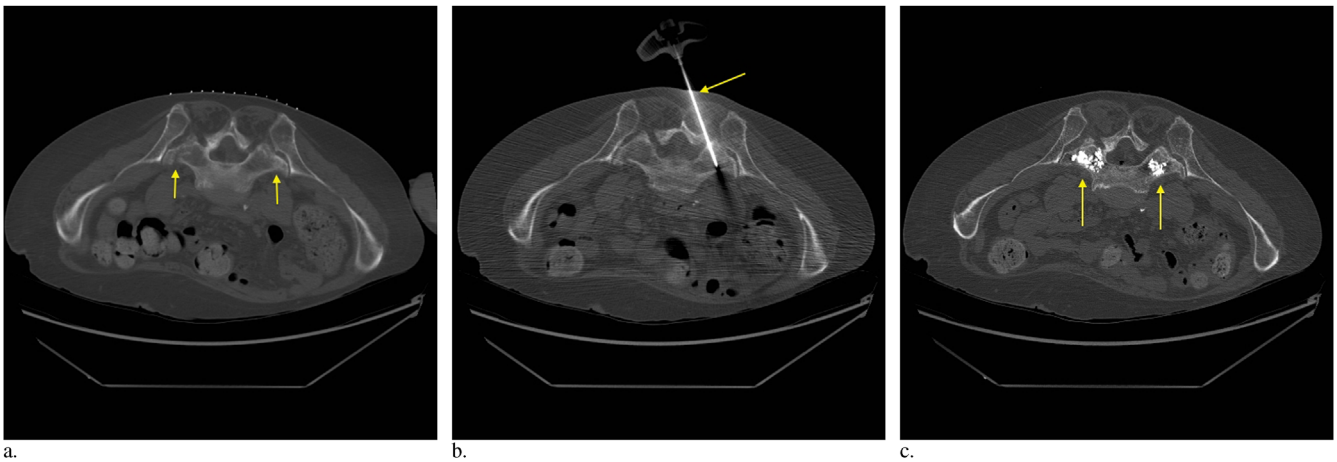

Figure 1. Noncontrast pelvic CT demonstrates **(a)** bilateral pelvic insufficiency fractures (arrows), **(b)** placement of a 13-gauge needle (arrow) within the left sacral fracture, and **(c)** postoperative appearance of polymethylmethacrylate cement within the sacral alae (arrows). (Available in color online at *www.jvir.org*.)