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# Percutaneous sacroplasty under fluoroscopic guidance for sacral insufficiency fracture resulting from plasmacytoma: A case report

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## ABSTRACT

**Introduction:** Bone tumors and osteoporosis can induce sacral insufficiency fracture (SIF), resulting in buttock pain due to the mass effect on the spinal canal. Percutaneous sacroplasty (PSP) is an effective treatment and minimally invasive procedure of injecting bone cement with fluoroscopy to assist in restoration in patients with SIF.

**Case presentation:** A 76-year-old woman presented to our hospital, with intractable buttock pain after a fall. She had also experienced worsening numbness and radiating pain in his left lower limb for approximately 3 months, PSP was requested due to the failure of conservative treatment.

**Conclusion:** For SIF resulting from plasmacytoma in the sacrum, PSP can be an alternative treatment because PSP has antitumor, stabilizing, and embolizing effects.

**Keywords:** Bone tumor, minimally invasive, percutaneous sacroplasty, sacral insufficiency fracture.

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## INTRODUCTION

Sacral insufficiency fracture (SIF) typically presents low back or buttock pain radiating to the legs. The risk factors are patients with osteoporosis, metastases originating from malignant tumors, radiation therapy, long-term steroid use, multiple myeloma, Paget's disease, and hyperparathyroidism. In the United States of America, women with osteoporosis have a two percent incidence of SIFs at the age of >55 years.<sup>1</sup> In patients undergoing radiotherapy, the incidence of SIFs is 89% in cervical cancer. The actual incidence is unknown, however, 1 – 5% of the entire population is at risk.<sup>1,2</sup>

Plasmacytoma is a cancer originating from plasma cells. There are two types of plasmacytoma, namely single and multiple which often occur in the axial bones, vertebrae, and skull. The ratio of men to women is 2:1 and the median age is 55 years. Single plasmacytoma is 10 years younger than multiple. The incidence is 3.5 per 1 million population.<sup>2</sup> In Taiwan, the incidence of plasmacytoma is 6.2% of all plasma neoplasms.<sup>2-5</sup>

SIF management includes conservative in the form of bed rest and analgesics. Percutaneous sacroplasty (PSP) can

also improve the patient's quality of life. However, the immobility applied to conservative therapy can lead to an increased risk of pulmonary embolism, deep vein thrombosis, pressure sores, and atrophy of the skeletal muscles, requiring further therapy in the form of rehabilitation.

Sacrum is a complex structure.<sup>2,4,6</sup> PSP which only uses guiding fluoroscopy can cause penetration into the abdominal cavity causing damage to visceral organs, so precision is needed from the tip of the Jamsidhi needle. It can also cause damage to the sacral nerves and errors in the placement of bone cement, causing foot drop.

## CASE PRESENTATION

A 76-year-old woman presented to our hospital, with intractable buttock pain after a fall. She had also experienced worsening numbness and radiating pain in his left lower limb for approximately three months. The pain in his back can reach 7 to 8 points using the visual analog scale (VAS) and cannot be alleviated with rest and medication. The patient denied experiencing any other constitutional

symptoms.

On physical examination, the patient showed pressure and percussion pain in her right sacral region, decreased sensation to pin-prick and fine-touch of his lower limb, and exhibited 3/5 strength in his bilateral lower limbs. Deep tendon reflexes revealed decreased knee-jerk and Achilles tendon reflexes bilaterally. Ataxia, cranial nerves, and the rest of the neurological examination showed no abnormalities. Preoperative hemodynamic and cardiovascular assessments included electrocardiogram and chest radiography. A preoperative laboratory assessment was conducted, including routine laboratory tests with no abnormalities.

X-rays revealed sacral lesions, with high suspicion of spinal bone tumors. A preoperative computed tomography scan and magnetic resonance imaging revealed an osteolytic tumor in the right sacrum with increased metastatic marrow infiltration of the sacrum. The tumor infiltrated through the right sacrum body into the posterior elements, thus spreading extraosseous into epidural space and extending posteriorly, resulting in spinal nerve compression (Fig. 1). PSP

and decompression were requested due to failure of conservative treatment (Fig. 2). Prior to PSP, a biopsy was carried out through the Jamsidhi needle. Post-

procedural plain x-ray was performed (Fig. 3) with the histopathology result of plasmacytoma (Fig. 4).

**DISCUSSION**

SIF increases in postmenopausal and osteoporotic women, with the incidence in women being higher than in men. There were 82,355 SIFs occurring in women, especially those aged 70 – 75 years old. While the highest risk is in women aged > 80 years old.<sup>1</sup> Malignant tumors of the sacrum can result in osteolytic and hypervascular lesions, often causing pain and immobility.<sup>3,6</sup> PSP is the injection of polymethyl methacrylate (PMMA) bone cement using guide fluoroscopy. PSP can reduce pain with the mechanism of strengthening damaged bones. Thermal effects result in short-term pain reduction and exothermal effects of PMMA in the polymerization process have contributed to reducing volume and causing tumor necrosis (thymoma, pheochroma, chondrosarcoma).<sup>3,4,6</sup>

PMMA particles can induce TNF mRNAs and proteins that have a tumor-limiting effect.<sup>6</sup> In this case, an osteolytic lesion was found in the right sacrum. The pain reduction rate is almost 90% with PSP. The main management is radiation to reduce the progression of the tumor. In this case, the patient underwent a biopsy and PSP. Chemotherapy and radiotherapy were then performed. In the first postoperative month, there was an improvement in the pain scale, disability, and no complications until the third month during outpatient follow-up.

**CONCLUSION**

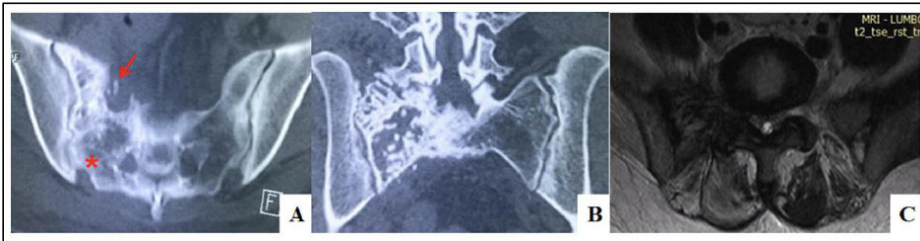
For SIF resulting from plasmacytoma in the sacrum, PSP can be an alternative treatment because PSP has antitumor, stabilizing, and embolizing effects. It can reduce oral medication consumption, reduce pain, facilitate mobilization, and improve the patient's quality of life.

**CONFLICT OF INTEREST**

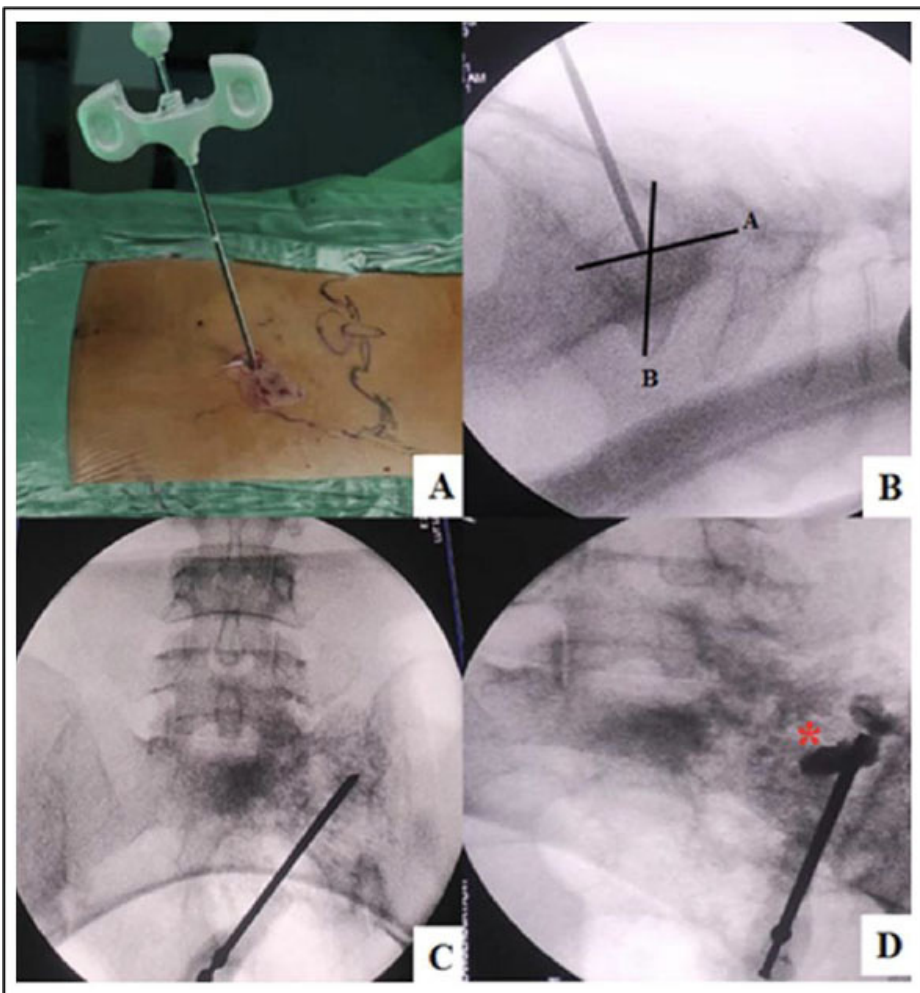
There is no conflict of interest related to the materials or methods used in this study.

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**Figure 1.** A. Axial; B. Coronal computed tomography scan image (bone windows); C. T2W1 magnetic resonance imaging reveals complete destruction of the right sacrum with osteolytic areas and fractures (arrow) and involvement of the posterior arch (asterisk).

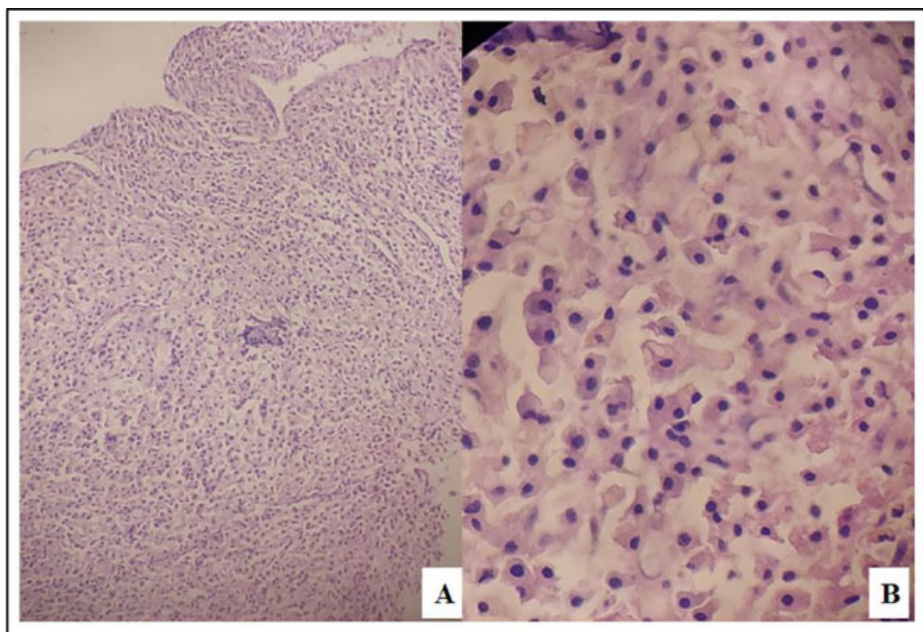


**Figure 2.** A. Insertion point; B. Use of a fluoroscopic landmark in performing sacroplasty note the target by the intersection line A (from the posterosuperior corner of S1 to the anteroinferior corner of S1) with line B (from the anterosuperior corner of S1 to the posteroinferior corner of S1); C. The initial anteroposterior image shows the needle in position at the intersection of lines as defined before; D. Post-treatment demonstrates polymethylmethacrylate cement in sacral alar with no presacral extravasation (asterisk).





**Figure 3.** Anteroposterior x-ray image of the bone cement in the sacrum obtained postoperatively (asterisk).



**Figure 4.** Microphotographs of biopsy from the sacrum with the magnification of x 100 (A) and x 400 (B). Hematoxylin and eosin sections show sheets of plasma cells with abundant eosinophilic cytoplasm and eccentric nucleus.

## AUTHOR CONTRIBUTIONS

The authors took part in the design of the study, contributed to data collection, and participated in writing the manuscript and all agree to accept equal responsibility for the accuracy of the contents of this article.

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