Brief Communication

Magnetic Resonance Imaging is Useful for Diagnosis of Sacral Insufficiency Fracture and Target Identification in Sacroplasty

Feng-Chen Kao[1,2], *Yao-Chun Hsu*[3-6], *Pao-Hsin Liu*[7], *Yuan-Kun Tu*[1,2]

Sacral insufficiency fractures (SIFs) are typically missed in roentgenograms and often neglected by clinical physicians. Magnetic resonance imaging (MRI) can detect early changes in SIF as bone marrow edema (low signal intensity at T1-weighted images and high signal intensity at T2-weighted images) at the sacral area (both the sacral body and sacral alar area). The patterns of SIF include unilateral or bilateral involvement in the sacral ala, with or without the sacral body involved, or transverse fractures of the lower sacrum. The approaches of sacroplasty include the following: the transiliac approach, the long-axis approach and the short-axis approach. The target could be identified on the area of SIF according to MRI findings.

Key words: MRI, sacral insufficiency fracture, sacroplasty, osteoporotic compression fracture

Sacral insufficiency fractures (SIFs) were first described by Laurie in 1982.[1] SIFs are reported in 1 – 5% of people in at-risk populations.[2,3] Typically missed in roentgenograms, SIFs are often neglected by clinical physicians.[1,4,5]

Bone scintigraphy is one of the most sensitive examinations for the detection of SIFs. The H-pattern or so-called “Honda” sign is considered diagnostic of SIFs;[6] however, this pattern is seen only in 20 – 40% of patients with SIF.[7] Variations of bone scintigraphy in SIFs include patterns oriented unilaterally in the sacral ala, unilaterally with a horizontal strut, bilaterally without a horizontal strut, and patterns with multiple foci.[8]

Magnetic resonance imaging (MRI) can, similarly to bone scintigraphy, detect early

From the [1]Department of Orthopedics, E-Da Hospital, Kaohsiung, and [2]School of Medicine for International Students, I-Shou University, Kaohsiung, and [3]School of Medicine, Big Data Research Center, Fu-Jen Catholic University, New Taipei, and [4]Division of Gastroenterology, Fu-Jen Catholic University Hospital, New Taipei, and [5]Graduate Institute of Clinical Medicine, China Medical University, Taichung, and [6]Division of Gastroenterology and Hepatology, E-Da Hospital, Kaohsiung, and [7]Department of Biomedical Engineering, I-Shou University, Kaohsiung, Taiwan
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Address reprint request and correspondence to: [1]Yuan-Kun Tu, and [2]Feng-Chen Kao, Department of Orthopedics, E-Da Hospital, No. 1, Yida Road, Jiaous Village, Yanchao District, Kaohsiung City 82445, Taiwan.
[1]Tel: +886-7-615-0011 ext. 2971,Fax: 886-7-6155352, E-mail: ed100130@edah.org.tw
[2]Tel: +886-7-615-0011 ext. 2971,Fax: 886-7-6155352, E-mail: ed100735@edah.org.tw

changes in sacral insufficiency, but with a reported sensitivity of approximately 100%.[9] SIFs can be detected as bone marrow edema (low signal intensity at T1-weighted images and high signal intensity at T2-weighted images) at the sacral area (both the sacral body and sacral alar area) (Fig. 1). MRI can detect patterns as variable as those detected by bone scintigraphy, including patterns oriented unilaterally (Fig. 2) or bilaterally in the sacral ala,[10] with or without the sacral body involved. MRI can even detect transverse fractures (Fig. 3) of the lower sacrum.[11]

Conservative treatment of SIFs with the standard care for pain, which includes bed rest, rehabilitation, and analgesics, is usually recommended.[12] Percutaneous sacroplasty was introduced in 2002 as a minimally invasive treatment for SIFs with persistent symptoms.[13] Sacroplasty is reported to relieve pain and improve mobility;[14,15] however, the relevant literature comprises mainly technical reports and case series.1[6,17] No consensus has been reached on the ideal approach. Currently, surgeons choose the method of sacroplasty according to their preference.

Sacroplasty approaches (Fig. 4) include the following. (1) The transiliac approach[18] is a lateral approach guided by computer tomography (CT) or fluoroscopy. Targets can include the scacral body or the sacral alar area. A longer needle is required for the long distance from the skin to the target sacrum site. (2) The long-axis appraoch[19] is CT guided. The entry point is the cortex at the S3 (sacrum) level and the target area is the S1 level. This method is useful for the sacral alar area but not for the sacral body area. (3) The short-axis approach[20] is a posterior approach guided by CT or fluoroscopy. Targets include the scacral body, the sacral alar area, and low transverse fractures.[11]

One needle is traditionally used for each side of the sacral alar in the transiliac or long-

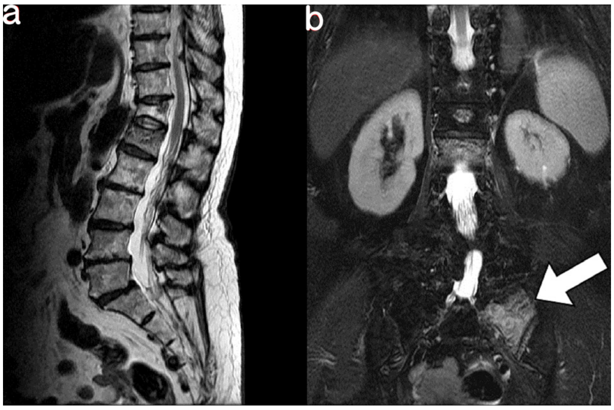

Fig. 2 MRI (a, T2-weighted sagittal view; b, T2-weighted coronal view) of an 76-year-old woman with sacral insufficiency fracture. SIF involve left alar area (white arrowheads)

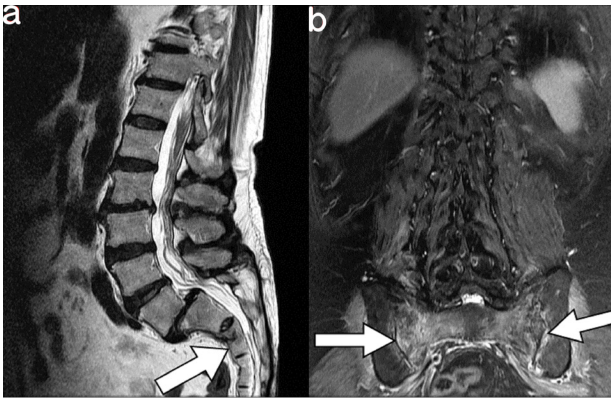

Fig. 1 MRI (a, T2-weighted sagittal view; and b,T2-weighted coronal view) of an 74-year-old woman with sacral insufficiency fracture. SIF involve S2 body level (white arrow) and bilateral alar area. MRI = magnetic resonance imaging, SIFs = sacral insufficiency fractures.

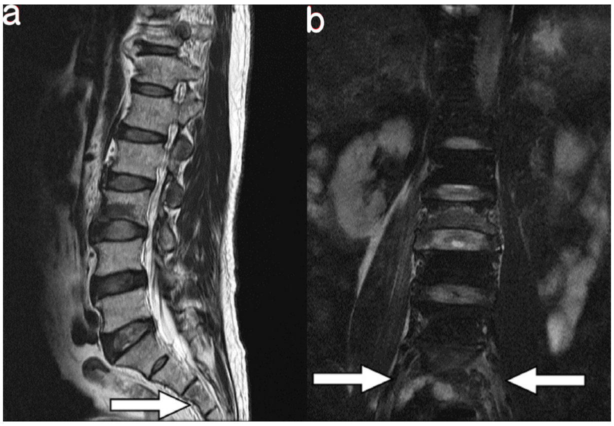

Fig. 3 MRI (a, T2-weighted sagittal view; b, T2-weighted coronal view) of a 67-year-old male with sacral insufficiency fracture. SIF involve S3 body level (white arrow) and transverse alar area (white arrowheads)

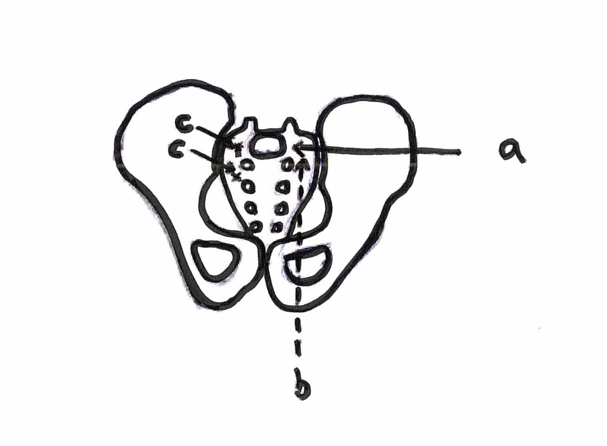

Fig. 4 Routes of sacroplasty. a: Transiliac approach, b: long-axis approach, and c: short-axis approach

axis approach, but the number of needles required for the short-axis approach depends on the number of targets (sacral body, sacral alar, S1, or S2 levels). The area in the sacrum usually considered is that capable of receiving the largest volume of cement injection, usually the S1 or S2 level.

In conclusion, MRI is valuable for diagnosing SIFs and identifying targets of sacroplasty. In addition, MRI should be considered to inform the management of SIF.

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