Fixation for Sacral Insufficiency Fractures Improves L5 Radiculopathy: A Report of Three Cases

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The incidence of pelvic fractures in the elderly is increasing[1)]. Among them, sacral insufficiency fractures (SIFs) have been reported to cause nerve root symptoms, similar to that of lumbar canal stenosis (LCS), making differentiating difficult[2)].

Herein, we report three cases of SIF treated with sacral osteosynthesis for diagnostic purposes, resulting in a rapid postoperative improvement in L5 radiculopathy.

Case 1 (representative case): A 77-year-old woman presented with severe pain in the right predominant buttocks to the outer lower legs. A physical examination revealed tenderness in the sacral area. No motor impairment was observed. The sensory loss occurred from the right outer lower leg to the big toe. Preoperative radiographs revealed severe degenerative scoliosis and suspected intervertebral foraminal stenosis (Fig. 1a). Magnetic resonance imaging (MRI) revealed no evidence of canal stenosis (Fig. 1b). T2-weighted MRI showed SIF (Fig. 1c), and computed tomography (CT) revealed SIF, Rommens classification[3)] (RC) Type IVb (Fig. 1d). As conservative treatment was ineffective, osteosynthesis was performed using a transiliac-transsacral screw (TITS) (Fig. 1e). On postoperative day 3, the leg pain was relieved to a numerical rating scale score of 2 out of 10.

Case 2: A 74-year-old woman presented with pain in the buttocks and lower legs. Preoperative plain radiography revealed severe degenerative scoliosis and suspected intervertebral foraminal stenosis (Fig. 2a). MRI showed L3/4 canal stenosis (Fig. 2b). MRI and CT revealed an SIF, RC Type IVb (Fig. 2c and d). The leg pain was relieved after sacral osteosynthesis using TITS (Fig. 2e).

Case 3: An 81-year-old woman presented with pain in the buttocks and lower legs. The patient underwent posterior lumbar fixation for an L1 burst fracture (Fig. 3a). MRI showed L4/5 canal stenosis (Fig. 3b). MRI and CT revealed a sacral alar fracture and an S2 vertebral body fracture, RC Type IVb (Fig. 3c and d). The leg pain was relieved after sacral osteosynthesis using TITS (Fig. 3e).

SIF is more common in patients with osteoporosis than in those without osteoporosis, and the risk factors for SIF include aging, female sex, and receiving steroids[4)]. SIF is difficult to differentiate from LCS because both can cause pain in the buttocks, legs, and groin. SIF is difficult to diagnose and is often unsuspected and unnoticed, as plain radiography has limited utility; thus, CT and MRI are recommended[2,5)]. SIF is often treated conservatively. However, surgical therapy is considered for early mobilization or in cases with neurological symptoms[5)].

Several previous reports have suggested that sacral fractures cause neurological injury, especially L5 radiculopathy. However, distinguishing them from the symptoms associated with LCS is difficult. Denis et al. reported that Zone I fractures present with neurological injury in 5.9% of cases, and L5 root damage is common[6,7)]. Vertical shear injuries of Zone II fractures directly compress the L5 nerve root[7)]. Even fractures in Zone I with minimal displacement may cause L5 radiculopathy due to nerve root irritation resulting from bone edema or bone callus[8)].

In our cases, L5 radiculopathy was suspected based on the characteristic imaging findings (Fig. 1f, 2f, 3f) and neuropathy consistent with the dermatome.

Our cases presented with L5 radiculopathy, which was difficult to differentiate from LCS. However, the radiculopa-

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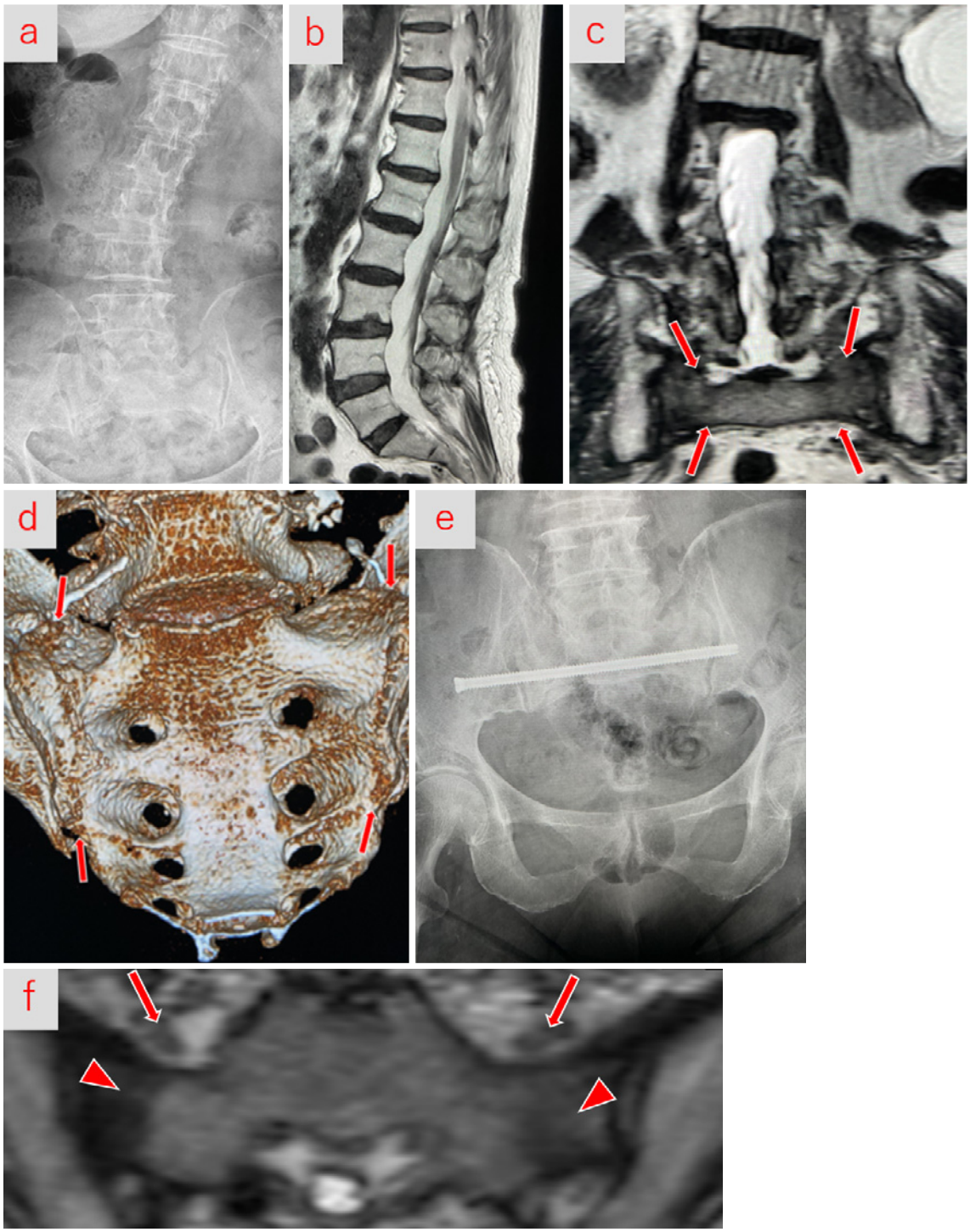

Figure 1. Case 1. a. Preoperative plain radiography showed severe degenerative scoliosis and suspected intervertebral foraminal stenosis. b. The magnetic resonance imaging (MRI) of the lumbar spine did not show evidence of spinal canal stenosis. c. T2-weighted MRI showed a sacral alar insufficiency fracture (arrows). d. Computed tomography (CT) revealed a minimally displaced sacral fracture, Denis classification Zone I, Rommens classification Type IVb, AO classification Type C2 (arrows). e. Postoperative plain radiography after osteosynthesis using transiliac-transsacral screw (TITS). f. T2-weighted MRI showed the L5 nerve roots (arrows) was near the site of the sacral fracture (arrowheads).

thy improved immediately after sacral osteosynthesis (Table 1). Improvement in L5 radiculopathy with sacral osteosynthesis suggests that SIF with little displacement may be symptomatic due to nerve root irritation by minor movements in the fracture.

The present report shows that sacral osteosynthesis, as a diagnostic treatment for SIF, improves L5 radiculopathy, which can occur with SIF and must be differentiated from LCS.

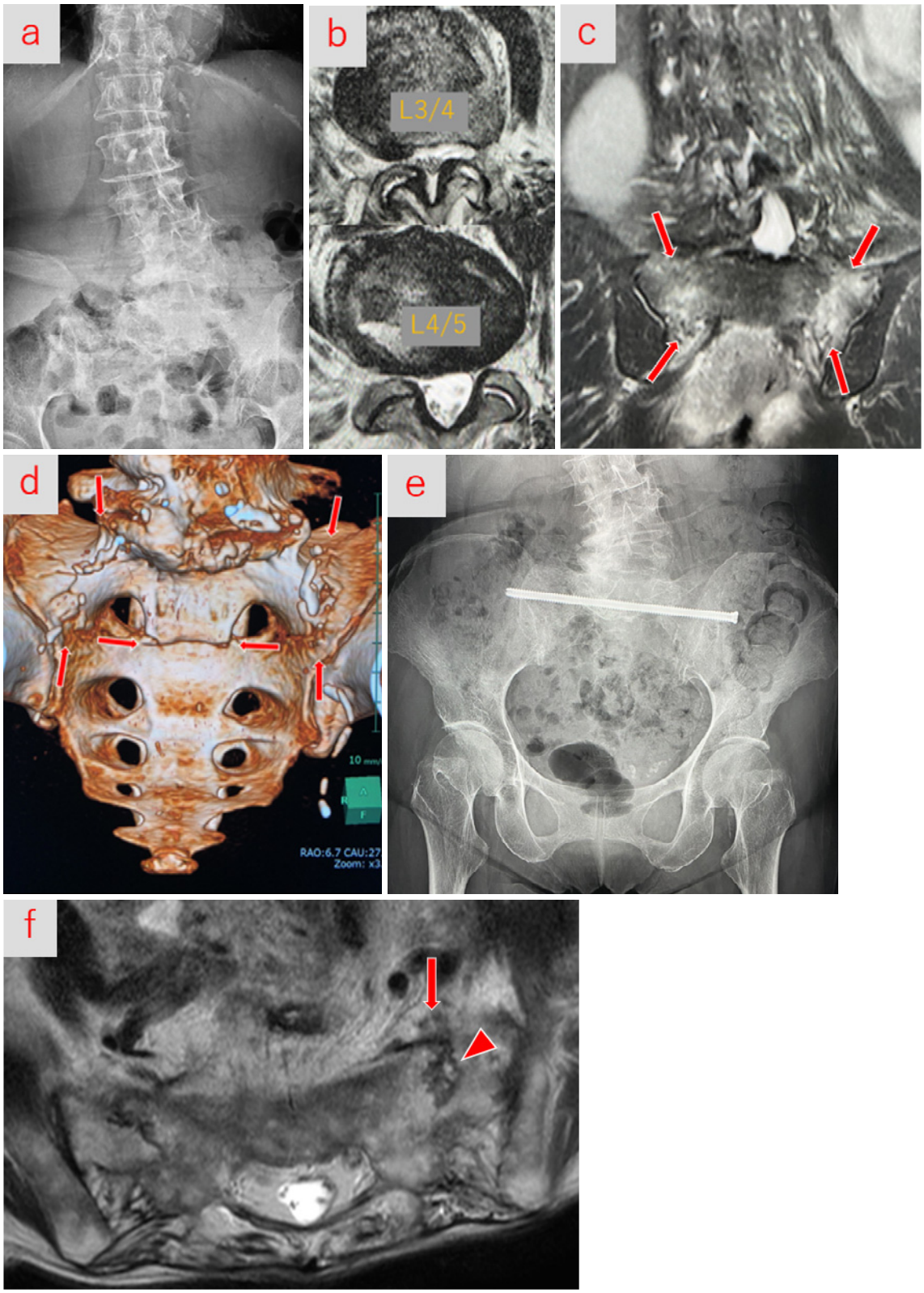

Figure 2. Case 2. a. Preoperative plain radiography showed severe degenerative scoliosis and suspected intervertebral foraminal stenosis. b. The magnetic resonance imaging (MRI) of the lumbar spine showed L3/4 canal stenosis. c. T2-weighted MRI showed a sacral alar insufficiency fracture (arrows). d. Computed tomography (CT) revealed a minimally displaced sacral fracture, Denis classification Zones I–III, Rommens classification Type IVb, AO classification Type C0 (arrows). e. Postoperative plain radiography after osteosynthesis using transiliac-transsacral screw (TITS). f. T2-weighted MRI showed the left L5 nerve root (arrow) was near the site of the sacral fracture (arrowhead).

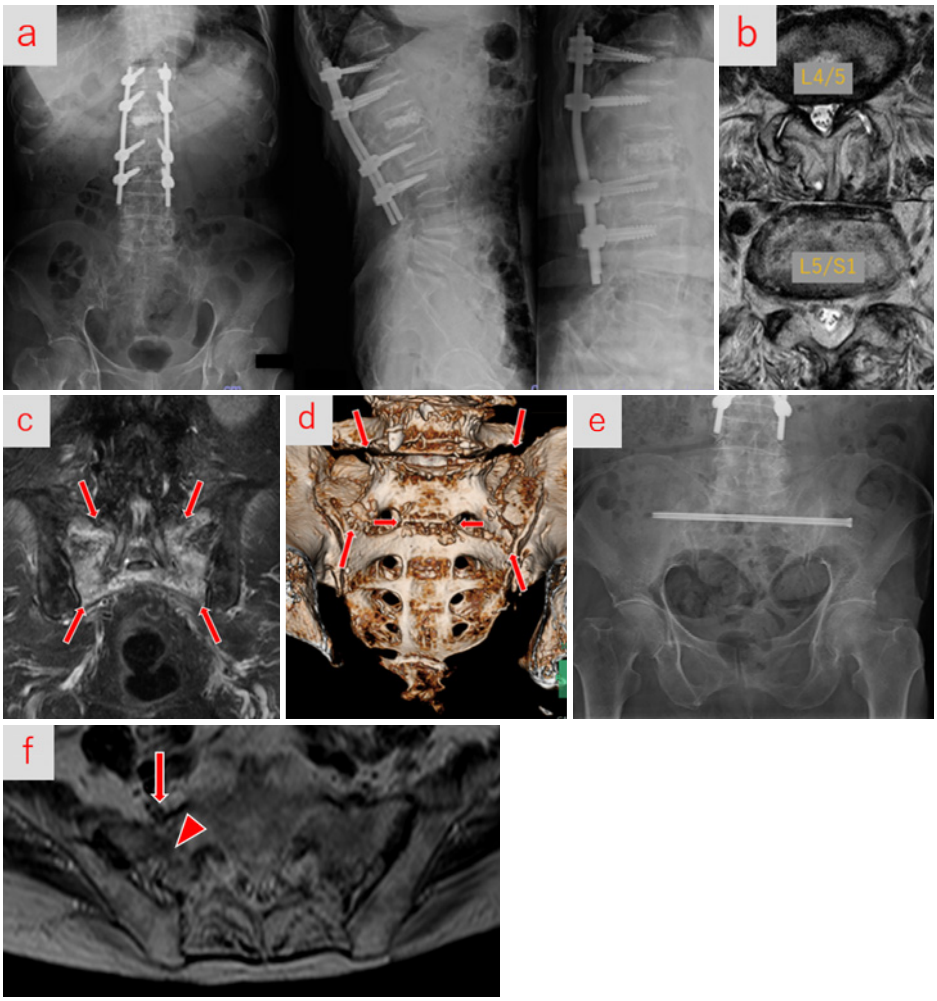

Figure 3. Case 3. a. Preoperative radiography showed no new fractures in the lumbar spine, implant loosening, or adjacent vertebral body fracture. b. The magnetic resonance imaging (MRI) of the lumbar spine showed L4/5 canal stenosis. c. T2-weighted MRI showed a sacral alar and S2 vertebral body fracture (arrows). d. Computed tomography (CT) revealed a minimally displaced sacral alar and S2 vertebral body fracture, Denis classification Zones I–III, Rommens classification Type IVb, AO classification Type C0 (arrows). e. Postoperative plain radiography after osteosynthesis using transiliac-transsacral screw (TITS). f. T2-weighted MRI showed the right L5 nerve root (arrow) was near the site of sacral fracture (arrowhead).

Table 1. Preoperative Imaging Findings and Postoperative Course of Cases 1–3.

Case	Lumbar X-ray	Lumbar MRI	Sacral CT/MRI	Surgical procedure	Postoperative leg pain
Case 1.	severe degenerative scoliosis: +	intervertebral foraminal stenosis: +	SIF Denis classification Zone I Rommens classification Type IVb AO classification Type C2	TITS	NRS 2/10 on the third postoperative day
Case 2.	severe degenerative scoliosis: +	L3/4 stenosis: +	SIF Denis classification Zones I–III Rommens classification Type IVb AO classification Type C0	TITS	NRS 3/10 on the third postoperative day
Case 3.	underwent posterior fixation for L1 burst fracture	L4/5 stenosis: +	SIF Denis classification Zones I–III Rommens classification Type IVb AO classification Type C0	TITS	NRS 0–1/10 on a postoperative day

MRI, magnetic resonance imaging; CT, computed tomography; SIF, sacral insufficiency fracture; TITS, transiliac-transsacral screw; NRS, numerical rating scale

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Informed Consent: The patients in this study provided informed consent.

References

1. Clement ND, Court-Brown CM. Elderly pelvic fractures: the incidence is increasing and patient demographics can be used to predict the outcome. Eur J Orthop Surg Traumatol. 2014;24(8):1431-7.
2. Tanaka H, Kawasaki M, Yamada M, et al. Difficult-to-diagnose pelvic insufficiency fractures-a report of two cases. Spinal Surg. 2015;29(2):179-85.
3. Rommens PM, Hofmann A. Comprehensive classification of fragility fractures of the pelvic ring: recommendations for surgical treatment. Injury. 2013;44(12):1733-44.
4. Dasgupta B, Shah N, Brown H, et al. Sacral insufficiency fractures: an unsuspected cause of low back pain. Br J Rheumatol. 1998;37(7):789-93.
5. Lambrechts MJ, Schroeder GD, Conaway W, et al. Management of C0 sacral fractures based on the AO spine sacral injury classification: a narrative review. Clin Spine Surg. 2023;36(2):43-53.
6. Rizkalla JM, Lines T, Nimmons S. Classifications in brief: the denis classification of sacral fractures. Clin Orthop Relat Res. 2019;477(9):2178-81.
7. Bydon M, Fredrickson V, De la Garaza-Ramos R, et al. Sacral fractures. Neurosurg Focus. 2014;37(1):E12.
8. Toussirot E, Bereau M, Aubry S. L5 radiculopathy with neurological deficit due to sacral insufficiency fracture. J Rheumatol. 2020;47(6):939-40.