

Fracture Patterns in Nuclear Medicine Imaging and Risk Factors of Sacral Insufficiency Fracture

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** None of the authors has any potential conflict of interest*

PURPOSE

To investigate the fracture pattern and risk factors associated with the development of sacral insufficiency fractures and to improve diagnosis in clinical practice.

MATERIALS AND METHODS

- Retrospective case series
- From June 2010 and December 2016
- JNUH, Seoul St. Mary's Hospital
- Medical records & radiological images review

MATERIALS AND METHODS

INCLUSION CRITERIA

- ① Sacral fracture (S32.1, S32.830)
- ② Minor trauma (eg. ground level falling, weight lifting)

EXCLUSION CRITERIA

- ① Pathologic fracture (metastasis, infection)
- ② High energy trauma (TA, fall from height)

MATERIALS AND METHODS

ASSESSMENT OF RISK FACTORS

- **Past Hx.**
 - Underlying disease (eg, RA, cancer)
 - Medication (Corticosteroid, osteoporosis medication)
 - Pelvic irradiation Hx.
- **Osteoporosis**
 - BMD (DXA, g/cm²) : Hip
 - T-score : Hip
 - Kind of Osteoporosis medication, Dose lengths

MATERIALS AND METHODS

RADIOLOGICAL ASSESSMENT

- X-ray
- CT
- MRI
- Bone scan
- Single photon emission computed tomography(SPECT)

STATISTICAL ANALYSIS

- SPSS 18.0
- Independent *t*-test
- Chi-square test

RESULTS

Participants

- 46 Pt.
- M : F = 4 : 42
- Age: 72.1±10.6
- BMI: 22.8±3.8 (kg/m²)
- Lumbosacral fusion: 16 Pt.

Medication Hx.

Steroid (3/46, 6.5%):

prednisolone

Osteoporosis medication (23/46,
50%)

BP (21/23, 91.3%)

SERM (2/23, 8.7%)

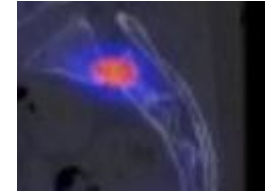
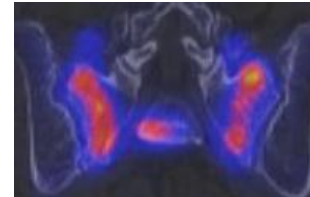
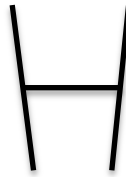
Radiation Hx.

None (0%)

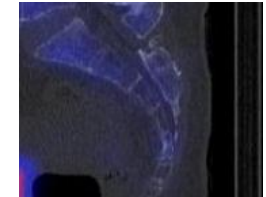
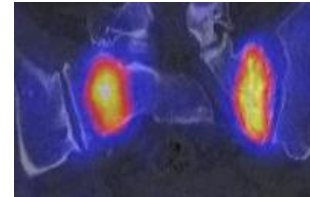
RESULTS

FRACTURE PATTERN

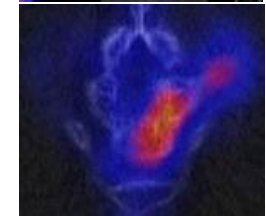
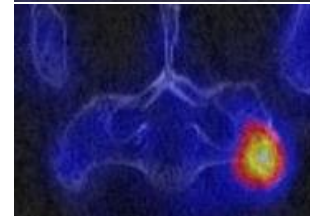
Bilateral sacral alae & body
(Classic H sign, Honda sign)



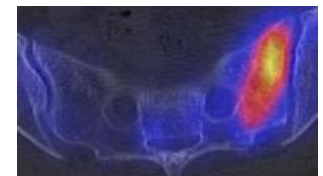
Bilateral sacral alae



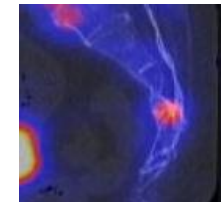
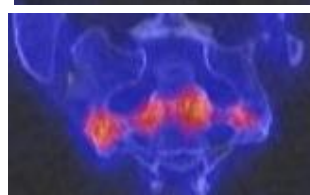
Unilateral sacral ala & body



Unilateral sacral ala



Sacral body

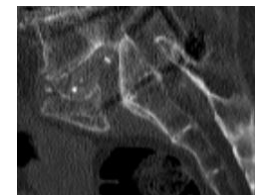
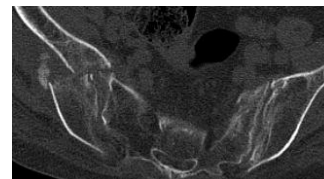


Atypical

Promontary compression

Coronally vertical

Etc,...



RESULTS

Underlying disease (N=33/46, Permission for repetition)

HTN (26, 56.5%)

DM (4)

Cancer (4)

lung ca(2), cholangio ca(1), gastric cancer(1), colon cancer(1)

RA(3), Sjogren disease(1)

CVA(4), CHF(2), A fib(3), AV block(1)

Pulmonary

ILD(1), COPD(1), PTE(1), B. Asthma(1)

Endocrinology

Adrenal insufficiency(1), Pancreatitis(2), Hyperlipidemia(1), Hypothyroidism(1)

CRF(1), LC(1), MDD(1), PSKT(1)

RESULTS

Fusion-Fracture Interval

Mean \pm SD: 128.07 \pm 84.5 months

Median: 112.7 months

Minimum: 1 month

Maximum: 304 month

- < 1Y : 2 pt
- 3 ~ 10 Y : 4 pt
- > 10 Y : 10 pt



RESULTS

	Lumbosacral fusion	Non-fusion	P-value
N	16	30	
Sex (M:F)	0:16	4:26	
Age	66.6±9.1	75.8±9.8	0.003
BMI (kg/m²)	24.6±3.34	21.4±3.8	0.010

	Lumbosacral fusion (N=16)	Non-fusion (N=30)	P-value
HIP			
BMD (g/cm ²)	0.688±0.113	0.611±0.118	0.056
T-score	-2.7±0.59	-2.81±1.29	0.855

RESULTS

		Lumbosacral fusion (N=16)	Non-fusion (N=30)	Total	P-value
Osteoporosis medication	Yes	10(62.5%)	13 (43.3%)	23(50%)	0.216
	No	6(37.5%)	17(56.7%)	23(50%)	
Dose-length (years)		8.1±5.04	3.45±3.08		0.024
		Fusion	Non-fusion	Total	P-value
Classic H-sign fracture		7 (43.8%)	20 (66.7%)	27 (58.7%)	0.133
Other type fracture		9 (56.3%)	10 (33.3%)	19 (41.3%)	

CONCLUSIONS

1. Old age, osteoporosis and postmenopausal women are risk factors.
2. Patients who had lumbosacral fusion to either L5 or S1 may suffer from sacral insufficiency fractures earlier in their life time than non-fusion people. BMI is statistically higher in fusion group than in non-fusion group.
3. No case of sacral insufficiency fracture in lumbopelvic fixation with iliac screw.
4. When performing multilevel fusion to lumbosacral junction, lumbopelvic fixation is recommended
5. Different scintigraphic patterns are presumed to represent varying grades of severity of sacral trauma