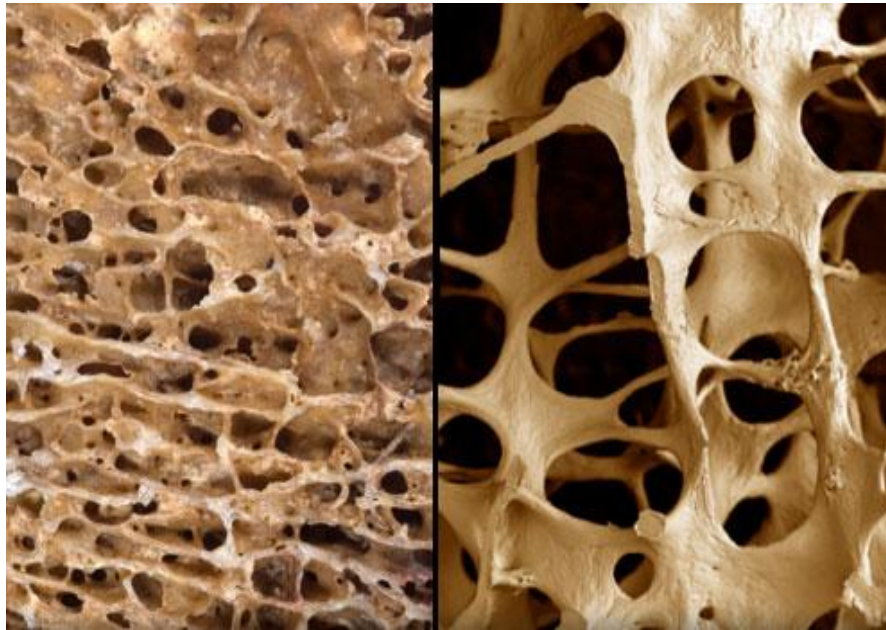


Clinical Efficacy of the Korean FRAX[®] Model According to the BMD Value in Osteoporotic Fracture Risk Prediction



 **ECTS**
European Calcified Tissue Society

International Bone
& Mineral Society

IBMS


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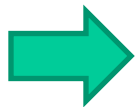
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Introduction

*Osteoporotic fractures have become
a major health and economic burden*

- ❖ *High complication*
- ❖ *Long term disability*
- ❖ *Quality of life*
- ❖ *Aging population*

Adachi JD et al, Osteoporos Int, 2001



Early prevention and intervention is important!!

Introduction

The World Health Organization(WHO) Fracture Risk Assessment Tool(FRAX[®])

Country: South Korea Name/ID: [About the risk factors](#)

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
 Age: Date of Birth: Y: M: D:

2. Sex Male Female

3. Weight (kg)

4. Height (cm)

5. Previous Fracture No Yes

6. Parent Fractured Hip No Yes

7. Current Smoking No Yes

8. Glucocorticoids No Yes

9. Rheumatoid arthritis No Yes

10. Secondary osteoporosis No Yes

11. Alcohol 3 or more units/day No Yes

12. Femoral neck BMD (g/cm²)

BMI: 23.6
 The ten year probability of fracture (%)
 with BMD

Major osteoporotic	6.2
Hip Fracture	1.6

Clinical Risk factor

- ✓ Age
- ✓ Sex
- ✓ Body mass index
- ✓ Previous fracture
- ✓ Parent history of hip fracture
- ✓ Current smoking
- ✓ Glucocorticoids use
- ✓ Rheumatoid arthritis
- ✓ Secondary osteoporosis
- ✓ Alcohol consumption
- ✓ **Bone mineral density**

10-year probability of major osteoporotic fracture and hip fracture

Introduction

NOF (National Osteoporosis Foundation)

Clinician's guide to prevent and treatment of osteoporosis

National Osteoporosis Foundation, Washington, DC, USA, 2010

- A hip or vertebral (clinical or morphometric) fracture **FRAX[®]**
- T-score ≤ 2.5 at the femoral neck or spine after appropriate evaluation to exclude secondary cause
- Low bone mass (T-score between -1.0 and -2.5 at the femoral neck or spine) and **a 10-year probability of a hip fracture $\geq 3\%$ or a 10-year probability of a major osteoporosis-related fracture $\geq 20\%$** based on the US-adapted WHO algorithm

Purpose



- ❖ *To examine clinical efficacy of Korean FRAX[®] as osteoporotic fracture prediction*
- ❖ *To evaluate the change in 10-year probability of osteoporotic fracture according to the BMD value*

Materials & Methods

From April 2003 to March 2013

- *With valid DXA measurements from the lumbar spine and femoral neck*
- *With ≥ 50 years old and < 90 years old ($n = 4556$)*
- *Osteoporotic fracture occurred ($n = 531$)*

**Osteoporotic fracture
(n=531)**

(Exclusion)

- **No valid DXA measurements within 2 weeks from the time of fracture (n=12)**
- **Lack of essential data for the FRAX[®] calculation (n=46)**
- **Had already received treatment for osteoporosis (n=28)**

**Final inclusion
(n=445)**

Materials & Methods

❖ *FRAX[®] Calculation*

- ✓ *Calculate FRAX[®] the day before the actual fracture*

(Not consider the actual fracture as a previous fracture)

- ✓ *Different BMD values (within 2 weeks from the fracture)*

(without T-score / with femoral neck T-score / with L-spine T-score)

Materials & Methods

❖ *Clinical efficacy (osteoporotic fracture risk prediction)*

✓ *Osteoporotic fracture group (very high risk group)*

*- To compare FRAX[®] the day before the actual fracture
with National Osteoporosis Foundation criterion*

✓ *High risk group (National Osteoporosis Foundation criterion)*

*- The 10-year probability of a major osteoporotic fracture and
hip fracture of $\geq 20\%$ or $\geq 3\%$, respectively*

Results



❖ Mean FRAX[®] calculated and number of high risk group

	Mean FRAX [®]		High risk group
FRAX * major	8.92±4.99	FRAX * major > 20%	30 (6.7%)
FRAX-HBMD † major	10.39±5.69	FRAX-HBMD † major > 20%	30 (6.7%)
FRAX-LBMD ‡ major	15.51±10.26	FRAX-LBMD ‡ major > 20%	134 (30.1%)
FRAX* hip	4.34±4.12	FRAX * hip > 3%	258 (58.0%)
FRAX-HBMD † hip	4.87±4.07	FRAX-HBMD † hip > 3%	281 (63.1%)
FRAX-LBMD ‡ hip	9.29±8.87	FRAX-LBMD ‡ hip > 3%	330 (74.2%)

SPSS 18.0 (Chicago, IL, USA)
Paired t-test

* FRAX: FRAX calculated without T-score
† FRAX-HBMD: FRAX calculated with femoral neck T-scores
‡ FRAX-LBMD: FRAX calculated with lumbar spine T-scores

Results



❖ Mean FRAX[®] calculated in patients with normal, osteopenia and osteoporosis.

	Normal (n=10)	Osteopenia (n=84)	Osteoporosis (n=351)	Total (n=445)
FRAX * major	3.85±0.26	7.93±5.83 <i>p</i> < 0.05	9.30±4.74 <i>p</i> < 0.05	8.92±4.99
FRAX-HBMD † major	2.75±0.47	6.48±3.89 <i>p</i> = 0.687	11.54±5.55 <i>p</i> < 0.05	10.39±5.69
FRAX-LBMD ‡ major	2.75±0.37	6.35±2.85	18.07±10.01 <i>p</i> < 0.05	15.51±10.26
FRAX * hip	1.30±0.95	4.02±3.94 <i>p</i> < 0.05	4.50±4.18 <i>p</i> < 0.05	4.34±4.12
FRAX-HBMD † hip	0.40±0.32	2.10±2.00 <i>p</i> = 0.483	5.65±4.13 <i>p</i> < 0.05	4.87±4.07
FRAX-LBMD ‡ hip	0.45±0.37	1.95±1.28	11.29±8.95 <i>p</i> < 0.05	9.29±8.87

SPSS 18.0 (Chicago, IL, USA)

Paired *t*-test

* FRAX: FRAX calculated without T-score

† FRAX-HBMD: FRAX calculated with femoral neck T-scores

‡ FRAX-LBMD: FRAX calculated with lumbar spine T-scores

Results



❖ *Number of high risk group according to NOF criteria in patients with normal, osteopenia and osteoporosis.*

	Normal (n=10)	Osteopenia (n=84)	Osteoporosis (n=351)	Total (n=445)
FRAX * major > 20%	0 (0%)	10 (11.9%)	20 (5.7%)	30 (6.7%)
FRAX-HBMD † major > 20%	0 (0%)	0 (0%)	30 (8.5%)	30 (6.7%)
FRAX-LBMD ‡ major > 20%	0 (0%)	0 (0%)	134 (38.2%)	134 (30.1%)
FRAX * hip > 3%	0 (0%)	39 (46.4%)	219 (62.4%)	258 (58.0%)
FRAX-HBMD † hip > 3%	0 (0%)	19 (22.6%)	262 (74.6%)	281 (63.1%)
FRAX-LBMD ‡ hip > 3%	0 (0%)	14 (16.7%)	316(90.0%)	330 (74.2%)

* FRAX: FRAX calculated without T-score

† FRAX-HBMD: FRAX calculated with femoral neck T-scores

‡ FRAX-LBMD: FRAX calculated with lumbar spine T-scores

Summary

❖ Osteoporotic fracture group (very high risk group)

✓ High risk group (National Osteoporosis Foundation criterion)

With femoral neck T-scores → 63.1 %

Without T-score → 58 %

Not able to classify at high risk in **about 40 %**

of the studied population the day before osteoporotic fracture.

Summary

❖ *In osteoporotic group*

Mean FRAX[®]

With lumbar spine T-score > With femoral neck T-score > Without T-score

High risk group: 97 pts. (28%) more detection

L-spine bone mineral density < Femoral neck bone mineral density

❖ *In osteopenia group*

Mean FRAX[®]

Without T-score > With femoral neck T-score ≐ With lumbar spine T-score

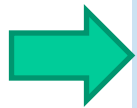
High risk group: 15pts. (18%) more detection

Bone mineral density is not sufficient influence as clinical risk factor

Conclusion

❖ *In patients with osteopenia*

For decision of anti-osteoporosis treatment



*Korean version of **FRAX**[®] without BMD values*

Could increase clinical efficacy.