71-year old woman
Back pain
Emergency Room
Plain X-ray

Case 1
What is the most effective method to detect recent fracture in spine?

1) Bone Mineral Density (BMD, DXA spine)
2) Ultrasonography (US, spine)
3) Computed Tomography (CT, spine)
4) Magnetic Resonance Imaging (MRI, spine)
5) Positron Emission Tomography (PET, FDG spine)
T12, L1, L2 Fractures

Plain X-ray

MRI T2WI
What is the most effective method to detect recent fracture in spine?

1) Bone Mineral Density (BMD, DXA spine)
2) Ultrasonography (US, spine)
3) Computed Tomography (CT, spine)
4) Magnetic Resonance Imaging (MRI, spine)
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Diagnosis of Osteoporosis and Fracture

- Simple Method: Plain X-ray (Osteopenia and Fracture)
- Quantitative Method: Bone Mineral Density (Osteoporosis)
- Supportive Methods: Bone scan, MRI, CT (Fracture)
- Biochemical Methods: Bone turnover markers (Osteoporosis)
- Metabolic Bone Diseases and Rare Bone Diseases: Bone Biopsy (Differential Diagnosis and Confirm)
Case 2

52-year old Woman
Low Bone Mineral Density
Out-patient Clinic
Fracture history (-)
Menopause : 1 year ago

Height 158cm
Weight 45kg
Blood Pressure 115/75mmHg
Pulse Rate 76/min
Bone Mineral Density (BMD)
Spine L1-4 T-score -1.8, Z-score -1.6
Femur total T-score -1.3, Z-score -1.2
T-L spine X-ray : Fracture (-)
Routine Lab. : normal range
What is the most appropriate medication?

1) Calcium and Vitamin D (Ca + D)
2) Estrogen and Progesterone (HRT)
3) Selective Estrogen Receptor Modulator (SERM)
4) Bisphosphonate (BP)
5) Parathyroid hormone (PTH)
## Medical Treatments (in Korea)

<table>
<thead>
<tr>
<th>Anti-resorptives</th>
<th>Formation Stimulants</th>
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</thead>
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<tr>
<td>1. Bisphosphonates</td>
<td>1. Androgen</td>
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<tr>
<td>2. SERM</td>
<td>2. Fluoride</td>
</tr>
<tr>
<td>3. Estrogen</td>
<td>3. Vitamin K</td>
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<td>4. Vitamin D</td>
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<td>5. Calcitonin</td>
<td>5. Strontium</td>
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<td>6. Ipriflavone</td>
<td>6. Anti-sclerostin antibody</td>
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<td>7. Calcium</td>
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<td>8. Denosumab (RANKL antibody)</td>
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<tr>
<td>9. Cathepsin K inhibitors</td>
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</tbody>
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Case 3

74-year old woman
Sustained wound after teeth extraction for 10 weeks
Out-patient Clinic
Type 2 DM
Postmenopausal Osteoporosis
Patient had been taking 6 years of Osteoporosis Medication. What is the most possible drug for this condition?

1) Estrogen and Progesterone (HRT)
2) Selective Estrogen Receptor Modulator (SERM)
3) Calcitonin (CT)
4) Parathyroid hormone (PTH)
5) Bisphosphonate (BP)
Adverse Effects of Bisphosphonates

• Gastrointestinal disturbance (Erosion, Ulcer)
• Acute Phase Reaction (Flu-like illness)
• Hypocalcemia
• Ocular complication (Conjunctivitis, Uveitis)
• Osteonecrosis of the Jaw (ONJ)
• Atypical Femur Fracture
Patient had been taking 6 years of Osteoporosis Medication. What is the most possible drug for this condition?

1) Estrogen and Progesterone (HRT)
2) Selective Estrogen Receptor Modulator (SERM)
3) Calcitonin (CT)
4) Parathyroid hormone (PTH)
5) Bisphosphonate (BP)
Case 4

43-year old woman
Low Bone Mineral Density
Out-patient Clinic
Fracture history (-)
LNMP : 1 month ago
Height 162cm
Weight 45kg
Blood Pressure 115/75mmHg
Pulse Rate 68/min
Bone Mineral Density (BMD)
Spine L1-4 T-score -2.7, Z-score -1.3
Femur total T-score -2.2, Z-score -1.1
T-L spine X-ray : no fracture
Routine Lab. : normal range
What is the most appropriate medication?

1) Calcium and Vitamin D (Ca + D)
2) Estrogen and Progesterone (HRT)
3) Selective Estrogen Receptor Modulator (SERM)
4) Parathyroid hormone (PTH)
5) Bisphosphonate (BP)
Premenopausal Osteoporosis

• Calcium and Vitamin D: usual risk (not high risk)
• Estrogen: premature ovarian failure
• SERM: not a candidate
• PTH: short-term (no evidence)
• Bisphosphonate: not a good candidate (fetal risk)
Bone Mineral Density (BMD)
Spine L1-4 T-score -2.7, Z-score -1.3
Femur total T-score -2.2, Z-score -1.1
T-L spine X-ray : no fracture
Routine Lab. : normal range
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Weight 45kg
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Pulse Rate 68/min
Bone Mineral Density (BMD)
Spine L1-4 T-score -2.7, Z-score -1.3
Femur total T-score -2.2, Z-score -1.1
T-L spine X-ray: no fracture
Routine Lab: normal range
What is the most appropriate medication?

1) Calcium and Vitamin D (Ca + D)
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Case 5

55-year old man
Low Bone Mineral Density
Out-patient Clinic
Fracture history (-)
Medication history (-)
Height 173cm
Weight 65kg
Blood Pressure 125/85mmHg
Pulse Rate 78/min
Bone Mineral Density (BMD)
Spine L1-4 T-score -2.8, Z-score -2.3
Femur total T-score -2.4, Z-score -2.1
T-L spine X-ray: Genant Grade 1 (mild degree) T12 compression fracture
What is the most common laboratory abnormality expected in this patient as Korean?

1) Serum Testosterone
2) Serum Cortisol, ACTH
3) Serum TSH and Free T4
4) Serum Prolactin and GH
5) Serum 25OHD and PTH
Laboratory Evaluation for Male Osteoporosis as Secondary Causes

Initial laboratory tests
• Complete chemistry profile (including alkaline phosphatase)
• Complete blood count
• Calcium, phosphorus
• 25 hydroxyvitamin D
• Testosterone
• Urinary calcium excretion

Additional laboratory tests if indicated
• 24 hour urine for free cortisol
• FSH, LH
• Prolactin
• Magnesium
• 1,25 dihydroxyvitamin D
• Intact PTH
• TSH
• Celiac screen
• Serum protein electrophoresis/urine protein electrophoresis
• Erythrocyte sedimentation rate
• Rheumatoid factor
• Ferritin and carotene levels
• Iron and total iron binding capacity
• Serum tryptase and histamine levels
• Homocysteine
• Skin biopsy for connective tissue disorders
• COL1A genetic testing for osteogenesis imperfecta
• Serum and urine markers of bone turnover

Late-Onset Hypogonadism. Korean Society for Aging Male Research. Korean Andrological Society
Case 5

55-year old man
Low Bone Mineral Density
Out-patient Clinic
Fracture history (-)
Medication history (-)
Height 173cm
Weight 65kg
Blood Pressure 125/85mmHg
Pulse Rate 78/min
What is the most common laboratory abnormality expected in this patient as Korean?

1) Serum Testosterone
2) Serum Cortisol, ACTH
3) Serum TSH and Free T4
4) Serum Prolactin and GH
5) Serum 25OHD and PTH
What is the most common laboratory abnormality expected in this patient as Korean?

1) Serum Testosterone, LH
2) Serum Cortisol, ACTH
3) Serum TSH and Free T4
4) Serum Prolactin and GH
5) Serum 25OHD and PTH